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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 8, NUMBER 14
JULY 15, 1975

W75-06851 -- W75-07350
CODEN: SWRABW

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 8, NUMBER 14
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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09 MANPOWER, GRANTS, AND FACILITIES
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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

AN X-RAY DIFFRACTION STUDY OF WATER STRUCTURES AND SOLVATED IONS IN AQUEOUS SOLUTIONS,
North Dakota Univ., Grand Forks. Dept. of Physics.
For primary bibliographic entry see Field 2K.
W75-06997

2. WATER CYCLE

2A. General

THE USE OF STREAMFLOW MODELS IN PLANNING,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
For primary bibliographic entry see Field 6A.
W75-06949

LARGE MATERIAL MODELS IN WATERSHED HYDROLOGY RESEARCH,
Agricultural Research Service, Fort Collins, Colo.
D. A. Woolhiser, and E. F. Schulz.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 63-74. (1973). 1 tab, 15 ref.

Descriptors: *Model studies, *Watersheds(Basins), *Research facilities, *Hydrology, Hydrologic aspects, Simulated rainfall, Mathematical models, Hydraulic models, Hydrographs, Runoff, Rainfall-runoff relationships, Overland flow, Turbulent flow, Laminar flow.

The results from both material and symbolic models must be merged to obtain a maximum insight into the behavior of the hydrologic systems. A large-scale experimental rainfall-runoff facility was described. The application of the symbolic model known as the kinematic mathematical model to the experimental results was shown. The frictional resistance to flow was defined by a four-parameter law. The necessity for a large-scale material model was shown by means of a diagram delineating the laminar-turbulent regimes on a distance-time solution domain. Large material models used in conjunction with mathematical models are very useful in understanding and predicting watershed behavior. The rainfall-runoff experimental facility at Colorado State University and the kinematic model for converging overland flow were considered as an example of this type of research approach. It was demonstrated that small material models of watersheds may be misleading because they ordinarily will not exhibit certain flow phenomena that are important in 'real world' hydrologic systems. (See also W75-06998) (Humphreys-ISWS)
W75-07004

APPLICATION OF PHYSICAL AND MATHEMATICAL MODELS FOR RIVER PROBLEMS,
Waterloopkundig Laboratorium, Delft (Netherlands).
I. M. de Vries.
In: General Reports, Discussions, Lectures, Vol. IV; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 370-393, (1973). 12 fig, 37 ref.

Descriptors: *Model studies, *Mathematical models, *Hydraulic models, Hydraulic similitude, Rivers, Estuaries, Hydraulics, Froude number, Reynolds number, Equations, Scaling, Flow characteristics, Calibrations, Computer models.
Identifiers: Fixed bed models, Movable bed models.

Comparisons and common aspects between physical and mathematical models were discussed. Use of both types of models has been proved important for design purposes as well as for the understanding of physical problems in rivers. Both types may be used for fixed bed and movable bed models. Common aspects include: (1) schematization of the prototype problem; (2) solving the engineering problem for the model and translating this solution into the solution for prototype problem; (3) model calibration using prototype data from an existing situation; and (4) scale effects. Physical models require a new model for every prototype, are less flexible than mathematical models, are not easily stored, and can provide more detail of flow pattern for such problems as bed configuration due to a three-dimensional flow pattern. Mathematical models are more flexible, do not require a new model for every prototype, are more easily stored, are suitable when a large reach has to be covered and only few details of flow phenomena are required, and require a relatively large amount of computer time for determining detail flow patterns. Both model types are possible for many problems and an example was discussed where the models were complementary. (See also W75-07038) (Humphreys-ISWS)
W75-07040

APPLICATION OF A CATCHMENT MODEL IN SOUTHEASTERN AUSTRAILIA,
Monash Univ., Clayton (Australia). Dept. of Civol Engineering.
J. W. Porter, and T. A. McMahon.
Journal of Hydrology, Vol 24, No 1/2, p 121-134, January 1975. 4 fig, 2 tab, 11 ref.

Descriptors: *Synthetic hydrology, *Mathematical models, *Computer models, Hydrology, *Watersheds(Basins), Model studies, Hydrographs, Instrumentation, Climates, *Australia.

Some results of the application of a computer catchment model to catchments in southeastern Australia were presented and discussed. Problems that were pertinent to model development and application were outlined. These include preparation time prior to application, the requirement for expertise in model use, inadequacies in hydrologic physics, difficulties of modeling in arid regions, and special aspects such as stream transmission losses. (Jess-ISWS)
W75-07054

RAINFALL AND SNOWMELT RUNOFF FROM INTERMEDIATE ELEVATION WATERSHEDS,
M. Molnau, D. J. Davis, L. Druffel, and R. S. C. Lee.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 502, $3.25 in paper copy, $2.25 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, September 1973. 13 p, 7 ref. OWRT A-029-IDA(1).

Descriptors: *Water balance, Snowmelt, Runoff, *Erosion, Evapotranspiration, *Mathematical models, *Agricultural watersheds, Forest watersheds, *Pacific Northwest US, Rainfall-runoff relationships, *Model studies.

Many low and intermediate elevation watersheds in the Pacific Northwest receive both rain and snow precipitation during the winter months. This results in winter runoff events that are damaging to agricultural land and can also decrease the snow water storage limiting water availability in late spring and early summer. The winter and spring runoff from forested lands was studied at a snow research site where melt from the rain and snow events could be measured. Predictable lags occurred between time of melt and time of peak in stream hydrographs. The Kentucky Watershed Model was also used to evaluate the effects of precipitation type and amount of runoff patterns. Runoff in the early winter was not satisfactorily modeled. An agricultural watershed was used to study runoff and erosion resulting from rain on snow and rain on frozen ground. Soil loss was found to depend mainly on amounts of precipitation since runoff began, volume of runoff, change in snow cover and soil moisture conditions. Rain on frozen ground produced less erosion than comparable amounts of rain on bare unfrozen soil. A study of the water balance showed that precipitation was distributed approximately 27 percent to runoff, 57 percent to evapotranspiration and 16 percent to deep percolation. It also showed the Penman method of computing evapotranspiration was satisfactory when compared to soil moisture changes.
W75-07101

PROCEDURES FOR EVALUATING THE SURFACE WATER BALANCE OF GRAN CANARIA,
United Nations Development Program, Las Palmas de Gran Canaria (Spain),
For primary bibliographic entry see Field 2D.
W75-07194

EVAPOTRANSPIRATION AND PLANT PRODUCTION DIRECTLY RELATED TO GLOBAL RADIATION,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
For primary bibliographic entry see Field 2D.
W75-07195

URBAN STORM RAINFALL-RUNOFF-QUALITY INSTRUMENTATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W75-07202

HISTORY OF HYDROLOGY--A BRIEF SUMMARY,
Geological Survey, Raleigh, N.C.
R. L. Nace.
Nature and Resources, Vol 10, No 3, p 2-9, July-September 1974. 2 fig.

Descriptors: *Hydrology, *Hydrologic cycle, *History, Data collections.
Identifiers: *History of hydrology.

Hydrology is a set of concepts about the role and behavior of water in the earth system. The central concept of hydrology is the hydrological cycle--the continual circulation of water through the system ocean-atmosphere-land-biosphere. The world ocean is both the source of all water in the system and the final destination of its circulation. The full-fledged concept of the hydrological cycle was born only about 300 years ago and it was not fully and clearly stated for another 100 years. During the latter part of the nineteenth century and early in the twentieth, scientists in nearly every European country made significant contributions to groundwater hydrology. A succession of brilliant investigations, based largely on laboratory studies with relatively little field observation, had led to formulation of ever more elegant mathematical expressions. In the latter part of the nineteenth century prominence in the whole field of hydrology began to shift to the United States. In the United States emphasis for many years was on the collection of basic data. The United States Geological Survey began systematic stream gaging in 1889. Within 75 years the national network of observation stations grew to about 25,000, including

streamflow, groundwater levels, chemical quality of water, and the suspended solid load of streams. The International Hydrological Decade (IHD) program gave a great impetus to study of all prinicipal aspects of hydrology, including large-scale water balances. (Knapp-USGS)
W75-07227

ANOTHER EXPLANATION OF THE OBSERVED CYCLONIC CIRCULATION OF LARGE LAKES,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 2H.
W75-07246

NEARSHORE LAKE CURRENTS MEASURED DURING UPWELLING AND DOWNWELLING OF THE THERMOCLINE IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W75-07251

EFFECT OF ARABIAN SEA-SURFACE TEMPERATURE ANOMALY ON INDIAN SUMMER MONSOON: A NUMERICAL EXPERIMENT WITH THE GFDL MODEL,
National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 2B.
W75-07255

RAINFALL-INDUCED RUNOFF COMPUTED FOR FALLOW FIELDS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
V. L. Hauser, and E. A. Hiler.
Transactions of American Society of Agricultural Engineers, Vol 18, No 1, p 122-125, January-February 1975. 5 fig, 1 tab, 13 ref.

Descriptors: Hydrology, *Great Plains, *Agriculture, *Equations, *Rainfall-runoff relationships, Runoff, Agricultural runoff, Surface runoff, Rainfall intensity, Rainfall, Solar radiation, Sheet erosion, Suspended load, Texas, Kansas, Iowa, Forecasting, *Runoff forecasting.

There are no long-term runoff records available that could be used to determine the needed runoff amount of return-frequency information for the western Great Plains; however, management of this water can increase yields. Rainfall amount and intensity, runoff, and soil water were measured on 3 terraced fields for 12 years. The soil was clay loam and had a slowly permeable layer; the average land slope was 1.5%. The fields were cropped in a wheat-sorghum-fallow sequence which gave 22 months of fallow for each 36-month period. Stubble mulch tillage was used to control wind and water erosion. A set of equations was developed to compute rainfall-induced runoff from fallow land with the use of daily rainfall, maximum 1-hr rainfall for the day, and computed soil water content. Equations were computed for three conditions (1) soil water content greater than field capacity, (2) fallow-after-wheat from June to January, and (3) fallow-after-sorghum plus after wheat January to June. About 15% more runoff was computed than was measured on a fallow period basis; however, a linear correction reduced the error to 4.6%. The following conclusions were drawn from the study: (1) the equations for soil water can be used to compute runoff from rainfall records; (2) soil water content may be computed and used successfully in runoff equations; (3) daily runoff can be computed accurately with inputs of daily rainfall, computed soil water content, and maximum 1-hr rainfall for the day; and (4) the use of computed soil water content permits the equation set to compute runoff for the whole year. (Dawes-ISWS)
W75-07261

COASTAL MORPHOLOGY,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2L.
W75-07270

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: HYDRAULICS OF SURFACE WATER RUNOFF,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
H. D. Copp, and D. T. Higgins.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-241 531, $6.25 in paper copy, $2.25 in microfiche. Washington Water Research Center, Pullman, Report No. 17B, November 1974. 150 p, 43 fig, 8 tab, 12 ref, 2 append. OWRT B-036-WASH(4) B-043-WASH(3), and B-050-WASH(3).

Descriptors: *Computer models, *Systems analysis, Runoff, *Washington, Probability, Model studies, Planning, Watershed management, Forecasting, *Simulation analysis, *Hydraulic models.
Identifiers: *Yakima River basin(Wash).

A computer model is described that is an accounting of water quality in the Yakima River that flows from upper watershed areas into and through predefined stream reaches to the watershed outlet. The model adds tributary streams at confluences, and subtracts withdrawals from the stream. The model is deterministic; water quantities must be specified. However, with (a) separate analyses to define water runoff at various levels of probability and (b) model use with these runoff quantities, future probabilistic events and their consequences can be analyzed. Model development recognized the flexibility which water planning must have. Accordingly, the user has considerable freedom in establishing (1) watershed description, (2) the stream system, (3) quantities of flow in the streams, (4)positions and quantities of withdrawals and/or return flows, (5) location and operation rules of storage-reservoirs, and (6) flow quantities needed to meet above-mentioned requirements. The model is thus capable of simulating many water management plans, existing or envisioned, and a wide range of water quatity regimes.
W75-07278

2B. Precipitation

DOPPLER RADAR OBSERVATIONS OF A HAILSTORM,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
L. J. Battan.
Journal of Applied Meteorology, Vol 14, No 1, p 98-108, February 1975. 4 fig, 3 tab, 22 ref. NSF Grants GA-24134 and GA-37825X.

Descriptors: *Radar, *Hail, *Air circulation, Remote sensing, *Arizona, Storms, Meteorology, Analysis, Instrumentation, On-site data collections.
Identifiers: *Doppler shift, Radar reflectivity, Hailstones, Hailstreaks.

A severe hailstorm, occurring on 10 August 1966, passed over a zenith pointing, X-band, pulsed-Doppler radar located on a mountain in southeastern Arizona. An analysis was made of measurements of radar reflectivity, mean Doppler velocity, variance of the Doppler spectrum, and calculated updraft velocity. The vertical air motions and characteristics of the hydrometeors within the storm were highly variable over distances of a few hundred meters to a few kilometers. The storm consisted of a series of updraft cores containing a number of discrete volumes, 1-2 km in diameter, of rapidly rising air with smaller accompanying eddies. The updraft cores were separated by regions of weak updrafts or downdrafts. For the most part, the highest reflectivities were outside the updraft cores. It was visualized that the hailstone growth was initiated within the updraft, not as a continuous process, but rather as pockets of hailstones within the fast-rising, distinct volumes. This process could account for the layers of clear and opaque ice within large stones by allowing them to pass through several rising volumes. It might also account for brief bursts of hail and short hailstreaks observed at the ground. (Jones-ISWS)
W75-07049

EXPERIMENTAL RESULTS WITH A RAIN ANALYZER,
Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
J. Sander.
Journal of Applied Meteorology, Vol 14, No 1, p 128-131, February 1975. 2 fig, 2 tab, 9 ref.

Descriptors: *Instrumentation, *Rainfall intensity, *Raindrops, Raingages, Measurement, Attenuation, Correlation analysis, On-site data collections, Precipitation(Atmospheric).
Identifiers: *Rain analyzer, Microwave attenuation.

The rain analyzer is an instrument with which the main part of the raindrop size spectrum can be determined. During measurements of the rain attenuation of millimeter waves, rainfall was recorded both with rain analyzers and with standard rain gages. The observed millimeter-wave attenuation was somewhat more directly related to rainfall rates obtained with the analyzer than to those measured with rain gages. The average drop-size distribution measured during the experiment was similar to that of Laws and Parsons. (Jones-ISWS)
W75-07050

EMPIRICAL FOG DROPLET SIZE DISTRIBUTION FUNCTIONS WITH FINITE LIMITS,
Northwestern Univ., Evanston, Ill. Interdisciplinary Atmospheric Sciences Research Group.
J. V. Mallow.
Journal of the Atmospheric Sciences, Vol 32, No 2, p 440-443, February 1975. 1 fig, 1 tab, 11 ref.

Descriptors: *Drops(Fluids), *Fog, Numerical analysis, Radar, Distribution patterns, Equations, Theoretical analysis.
Identifiers: *Size distribution, Lidar.

The Deirmendjian-Chu-Hogg fog droplet size distribution function N(a) = Ca to the alpha power exp (- (alpha/gamma) a to the gamma power) restricts the parameters alpha and gamma to be positive. A procedure for calculating realistic fog distributions, including appropriate normalization, was outlined. It was shown that actual distributions are described by both positive and negative alpha and gamma. (Jones-ISWS)
W75-07051

HAIL AND RAINDROP SIZE DISTRIBUTIONS FROM A SWISS MULTICELL STORM,
Eidgenoessische Technische Hochschule, Zuerich (Switzerland).
B. Federer, and A. Waldvogel.
Journal of Applied Meteorology, Vol 14, No 1, p 91-97, February 1975. 6 fig, 1 tab, 23 ref.

Descriptors: *Hail, *Rainfall, Thunderstorms, *Instrumentation, Remote sensing, Radar, Distribution patterns, Raindrops, Storms, Measurement.
Identifiers: Liquid water content, Hailstreaks, *Switzerland.

Time-resolved hail and raindrop size distributions measured simultaneously during a multicellular hailstorm were presented. The time variation of the size distributions allowed a detailed analysis of the structure of the hailswath. It consisted of four

hail cells with a duration of 2-3 min each. The number density of the hailstones increased and the mean diameter decreased during the lifetime of a cell. The contributions of liquid water and ice water content to the total water W was about equal; W was never larger than 5 g/cu m. The size distributions were well approximated by an exponential law. The mean distribution was given by N sub H (D) = 12 exp(-0.42D). The distributions were compared with measurements and calculations of other authors and the differences were discussed. (Jones-ISWS)
W75-07056

STATIONARITY OF MESOSCALE AIRFLOW IN MOUNTAINOUS TERRAIN,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
G. L. Wooldridge, and R. I. Ellis.
Journal of Applied Meteorology, Vol 14, No 1, p 124-128, February 1975. 5 fig, 1 tab, 12 ref.

Descriptors: *Winds, *Mountains, Velocity, Turbulence, Turbulent flow, *Utah, On-site data collections.
Identifiers: *Mesoscale, Superpressure balloons, Double theodolites, *Cache Valley(Utah).

Criteria for stationarity of turbulent atmospheric flow were examined for the mesoscale in a mountain valley in northeastern Utah. Data from four sequences of superpressure balloon flights were used. It was shown that the horizontal components of the Lagrangian velocities at levels below the ridges of the surrounding mountains are only weakly stationary; the vertical component fits the criteria better. Above the ridge levels all components of the velocities exhibit reasonable stationarity in the turbulent flow. (Jones-ISWS)
W75-07061

GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE, NO. 2, SUMMARY REPORT 1973.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 7C.
W75-07076

SEVERE RAINSTORM AT ENID, OKLAHOMA OCTOBER 10, 1973,
National Severe Storms Lab., Norman, Okla.
L. P. Merritt, K. E. Wilk, and M. L. Weible.
NOAA Technical Memorandum ERL NSSL-73, November 1974. 50 p, 24 fig, 3 tab, 14 ref.

Descriptors: *Storms, *Precipitation(Atmospheric), *Floods, Rainfall, Weather forecasting, Cyclones, Forecasting, *Oklahoma.
Identifiers: *Severe storms, *Convective rainstorms, Synoptic conditions, Precipitation forecasting, Enid(Okla).

On October 10, 1973, a convective rainstorm devastated Enid, Oklahoma, and resulted in extensive flood damage over five counties in north central Oklahoma. Meteorological analyses at synoptic, subsynoptic, and mesoscales indicate that (1) evolution of the storm system was governed largely by conditions and events at the synoptic scale; (2) concentrated convective rainfall in north central Oklahoma occurred in conjunction with, and in all likelihood significantly enhanced development of a major extratropical cyclone; and (3) the most outstanding feature of the storm system was the formation of a stationary and well-defined region of sustained convective activity wherein individual cells formed repeatedly and moved northward, reaching maturity, in most instances, as they passed over the Enid area. Although the rarity of the Enid storm precluded anticipating its occurrence, it is likely that short-term forecasting of precipitation amounts and flash flood potential could have been significantly improved with detailed hourly analyses of subsynoptic surface data and digital radar data using objective techniques. (NOAA)
W75-07077

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS FOR GREAT LAKES AREAS: VOLUME 2, LAKE HURON AND GEORGIAN BAY.
National Climatic Center, Asheville, N.C.
Summary of Synoptic Meteorological Observations for Great Lakes Areas; Volume 2, Lake Huron and Georgian Bay, January 1975, 250 p.

Descriptors: *Climatology, *Atmospheric circulation, Climates, *Weather, *Precipitation(Atmospheric), Temperature, Wind, Cloud cover, Humidity, Weather observations, Wind direction, Wind velocity, Velocity measurement, Wind pressure, Pressure, Water waves, Lake waves, Visibility, Fog, *Great Lakes, *Lake Huron.
Identifiers: *Georgian Bay(Lake Huron).

This volume is one in a series of four intended to serve as a large scale climatic guide to thirteen major Great Lakes areas. Consisting entirely of tables, this volume contains data on weather occurrence by wind direction and hour; mean wind speed by direction and hour; mean cloud amounts by wind direction; ceiling heights; cloud amounts; visibility; relative humidity by air temperature; wind direction by air temperature; means, extremes and percentiles of air temperature; occurrence of fog; sea height; wave height versus wave period; monthly and annual percent frequencies, and means of sea surface temperature; and monthly and annual sea level pressures. (NOAA)
W75-07079

MANUALLY DIGITIZED RADAR GRIDS: A COMPARISON OF RESOLUTION CAPABILITIES FOR A HEAVY RAINFALL SITUATION,
National Weather Service, Fort Worth, Tex. Southern Region.
J. D. Belville.
NOAA Technical Memorandum NWS SR-80, February 1975, 16 p.

Descriptors: *Radar, *Rainfall intensity, *Rainfall-runoff relationships, Depth-area-duration analysis, Meteorology, Precipitation(Atmospheric), Precipitation intensity, Rain, Rainfall, Rainfall disposition, Hydrology, Hydrologic properties, Hydrologic data, Flood control, Texas.
Identifiers: *Manually Digitized Radar Program, Pecos River Storm(Tex).

The National Weather Service (NWS) hydrologic and radar programs must improve techniques in accurately locating and quickly identifying heavy rainfall patterns to prevent loss of life. One approach to this problem was the introduction of the Manually Digitized Radar (MDR) Program. This system enabled forecasters and hydrologists to keep track of rainfall patterns by using a quantitative index. Refinement of this system is necessary in order to increase its reliability. In this paper, a higher resolution grid, about 20 n mi (37km) on a side, is used in an attempt to locate a rainfall pattern with more precision than is possible with the present system. Use of the smaller grid also provides a better basis for estimating the magnitude of the rainfall in areas where rainfall data are sparse. (NOAA)
W75-07081

JUMBO TORNADO OUTBREAK OF 3 APRIL 1974,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
T. T. Fujita.
Weatherwise, Vol 27, No 3, p 116-126, June 1974. 17 fig, 1 tab, 10 ref. NESS 0404-158-1, NASA NGR 14-001-008.

Descriptors: *Tornadoes, *Meteorological data, Maps, Storms, Cyclones, Wind(Meteorology), Aerial surveys, *Aerial photography, Topography, United States.
Identifiers: *Severe storms, Tornado paths, Tornado cyclone.

Following the Jumbo tornado outbreak, an extensive aerial survey was performed in cooperation with the National Severe Storms Laboratory and the University of Oklahoma. The aerial survey revealed that the total path length of tornadoes in the eleven-state area was in excess of 2000 miles. Statistics during the past three years indicate that the total path mileage of U.S. tornadoes is approximately 4000 miles per year. Just about one-half of this total path mileage occurred within an 18-hour period beginning at 1400 CDT on 3 April. Tornado paths were found in unexpected locations such as in deep canyons, and on steep slopes of mountains. The Jumbo outbreak of tornadoes on 3-4 April 1974 in terms of the total number and the path mileage was more extensive than all known outbreaks. Besides, the tornado characteristics included many important aspects such as multiple suction vortices, family tornadoes, and cousin tornadoes spawned from interacting tornado cyclones. (NOAA)
W75-07082

RESEARCH NEEDS RELATED TO HYDROMETEOROLOGIC ASPECTS OF FUTURE ENERGY PRODUCTION,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 6D.
W75-07094

1973 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,
Oregon State Water Resources Board, Salem.
For primary bibliographic entry see Field 7C.
W75-07150

PRELIMINARY RESULTS OF THE COMPARISON OF THE AMOUNT OF ARTIFICIAL PRECIPITATION AND WATER RESERVES OF SEEDED FRONTAL CLOUDS,
For primary bibliographic entry see Field 3B.
W75-07163

INFRARED EMISSIVITY, SHORT-WAVE ALBEDO, AND THE MICROPHYSICS OF STRATIFORM WATER CLOUDS,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
G. W. Paltridge.
Journal of Geophysical Research, Vol 79, No 27, p 4053-4058, September 20, 1974. 6 fig, 2 tab, 17 ref.

Descriptors: *Infrared radiation, *Solar radiation, *Physics, *Clouds, Albedo, Radiation, Thermal radiation, Absorption, Drops(Fluids), Particle size, Entrainment.
Identifiers: *Infrared emissivity, *Short-wave albedo, Stratocumulus, Liquid water content, Drop-size distribution, Black body radiation, Mean free path.

Simultaneous measurements of the microphysics and solar and thermal radiation fields of stratocumulus clouds were reported. It was shown that the mass absorption coefficient a sub o for window infrared radiation should be almost independent of position in these clouds because of the manner in which liquid water content and drop size distribution vary with height. Its theoretical value is of the

order of 650 sq cm/g. Measured values of total emissivity yield an a sub o in the range 150-800 sq cm/g. Such clouds must be at least 500 m thick in order to be optically black to longwave radiation. Neiburger's (1949) result that the two-stream approximation overestimates the shortwave albedo of thin clouds was not supported by the present work. His discrepancy between observation and theory can be largely eliminated by taking specific account of the increase in liquid water content with height. (Jones-ISWS)
W75-07196

EFFECTIVENESS OF CONTROLLED CONVECTION IN PRODUCING PRECIPITATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
For primary bibliographic entry see Field 3B.
W75-07199

ESTIMATES OF TEMPERATURE AND PRECIPITATION FOR NORTHEASTERN UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4A.
W75-07241

THE JANUARY GLOBAL CLIMATE SIMULATED BY A TWO-LEVEL GENERAL CIRCULATION MODEL: A COMPARISON WITH OBSERVATION,
RAND Corp., Santa Monica, Calif.
W. L. Gates.
Journal of the Atmospheric Sciences, Vol 32, No 3, p 449-477, March 1975. 41 fig, 1 tab, 27 ref. ARPA Contract DAHC15-73-C-0181.

Descriptors: *Climates, *Computer models, *Circulation, Atmospheric pressure, Winds, Temperature, Moisture, Clouds, Precipitation(Atmospheric), Evaporation, Heat balance, Climatology, Model studies, Meteorology.

The mean global distributions of pressure, temperature, wind, moisture, cloudiness, precipitation, evaporation, and surface heat balance simulated for January by the two-level Mintz-Arakawa atmospheric general circulation model were compared with the corresponding observed fields. Although there were a number of shortcomings, in general the large-scale distribution of global climate was reasonably well portrayed by the model, in spite of its limited vertical resolution. The model simulates the semi-permanent cyclones and anticyclones of both the tropics and higher latitudes in approximately their correct positions, together with the associated large-scale temperature and circulation fields of the middle and lower troposphere. In comparison with models of greater resolution, these results suggest that with further selective improvements in the physical parameterizations, relatively coarse global models (of correspondingly lower computational demands) are useful tools in the study of many aspects of climate. The most prominent errors of the present model simulations were in the portrayal of processes related to the transfer of moisture. The simulated cloudiness was about half that observed (in the Northern Hemisphere), and the average precipitation rate was about twice that observed and extends over too broad a zone in the tropics. (Jones-ISWS)
W75-07253

EFFECT OF ARABIAN SEA-SURFACE TEMPERATURE ANOMALY ON INDIAN SUMMER MONSOON: A NUMERICAL EXPERIMENT WITH THE GFDL MODEL,
National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
J. Shukla.
Journal of the Atmospheric Sciences, Vol 32, No 3, p 503-511, March 1975. 10 fig, 1 tab, 20 ref.

Descriptors: *Monsoons, *Temperature, *Oceans, Computer models, Atmospheric pressure, Statistical analysis, Precipitation(Atmospheric), Winds, Evaporation, Moisture, Model studies, Summer, *Indian Ocean.
Identifiers: *Sea temperature anomaly, *Arabian Sea, Somali coast.

The global general circulation model of the Geophysical Fluid Dynamics Laboratory was integrated with and without a cold sea surface temperature (SST) anomaly over the Somali coast and the western Arabian Sea. The temperature anomaly is -3C near the Somali coast and linearly decreases eastward having zero anomaly at about 1500 km east of the coast. Comparison of the mean of the two model states indicates that the rainfall over India and the adjoining region is drastically reduced due to the colder SST anomaly over the western Arabian Sea. The other associated features due to the cold anomaly are an increase in sea surface pressure over the Arabian Sea, a decrease in local evaporation, and a reduction in the cross equatorial component of the wind at the surface and hence a reduction in the cross equatorial moisture flux. Statistical analysis of the results was done by comparing the difference between the two mean states (signal) and the standard deviation of the errors (noise) in estimating the mean due to the finiteness of the averaging period. It was found that the results of the present numerical experiment are statistically significant. (Jones-ISWS)
W75-07255

DEVELOPMENT OF BANDED STRUCTURE IN A NUMERICALLY SIMULATED HURRICANE,
National Weather Service, Silver Spring, Md.
M. B. Mathur.
Journal of the Atmospheric Sciences, Vol 32, No 3, p 512-522, March 1975. 8 fig, 1 tab, 22 ref. NSF Grant GA35093.

Descriptors: *Hurricanes, *Computer models, *Storms, *Simulation analysis, Latent heat, Convection, Numerical analysis, Atmosphere, Heating, Meteorology.
Identifiers: *Cloud bands, Vertical motion.

The developments of the propagating and the stationary bands in a three-dimensional model of a hurricane (Isbell, 1964) were investigated. Propagating bands in the vertical motion fields in the middle and the upper troposphere form in the regions of strong heating in the upper troposphere and weak cooling in the middle troposphere. The structures of the wind, temperature, and pressure fields in these bands are similar to those observed in the outer radar bands of hurricanes. Strong, nearly stationary bands form close to the center in the intense storm stage. Results of two experiments, one (M1) in which the so-called nonconvective release of latent heat in the upper troposphere was included and the other (M2) in which this heating was not incorporated, were compared. Convective release of latent heat was included in both experiments. The stationary bands which formed in M1, also developed in M2. The propagating bands which formed in M1, however, did not develop in M2. The rate of intensification of the simulated storm in M1 was nearly the same as observed by Isbell; it was, however, significantly weaker in M2. It was shown that the inclusion of nonconvective release of latent heat in M1 enhanced the upper tropospheric outflow which induced strong zones of convergences in the boundary layer. The resulting increase in the upward motion at the top of the boundary layer augmented the convective release of latent heat and led to a rapid intensification of the disturbance. (Jones-ISWS)
W75-07256

ICE CLOUDS AT THE SUMMER POLAR MESOPAUSE,
National Oceanic and Atmospheric Administration, Boulder, Col. Aeronomy Lab.
G. C. Reid.
Journal of the Atmospheric Sciences, Vol 32, No 3, p 523-535, March 1975. 7 fig, 22 ref, 1 append.

Descriptors: *Clouds, *Ice, *Cloud physics, Summer, Satellites(Artificial), Water vapor, Computer models, *Polar regions, Arctic, Solar radiation, Sublimation, Eddies, Diffusion, Equations.
Identifiers: *Mesopause, Noctilucent clouds, Mixing ratio, Sublimination nuclei.

Recent satellite observations showed the existence of a persistent layer of light-scattering particles in the vicinity of the polar mesopause during the summer. The suggestion was made that this layer consists of ice particles, and that noctilucent clouds are a sporadic manifestation of the layer near its low-latitudes edge. The consequences of this proposal in terms of the water vapor content of the mesosphere were explored through the development of a model for such a cloud, in which the water vapor mixing ratio was assumed to be 1 to 10 ppm at 60 km, and the temperature was assumed to drop to values well below 140 K at the mesopause. Water vapor is transported upward by eddy diffusion, and is photodissociated by solar ultraviolet radiation. Sublimation nuclei of radius 10 angstrom were assumed to exist in the vicinity of the mesopause, and the growth of the ice particles and their terminal speed of descent were calculated from simple kinetic theory considerations. The results indicate that radii of order 1000 angstrom cannot be attained by spherical cloud particles unless there is much more water vapor in the mesosphere than current estimates suggest, or unless there is a substantial and persistent upward motion of the mesosphere as a whole. Nonspherical shapes were also considered, however, and it was found that needle-shaped and disc-shaped particles can readily grow to linear dimensions of order 1000 angstrom. (Jones-ISWS)
W75-07257

TRANSFER OF PARTICLES IN NONISOTROPIC AIR TURBULENCE,
Istituto di Fisica dell-Atmosfera, Bologna (Italy).
M. Caporaloni, F. Tampieri, F. Trombetti, and O. Vittori.
Journal of the Atmospheric Sciences, Vol 32, No 3, p 565-568, March 1975. 3 fig, 12 ref.

Descriptors: *Mathematical models, *Atmospheric physics, *Particle size, *Velocity, Turbulence, Turbulent flow, Numerical analysis, Diffusion, Atmosphere.
Identifiers: *Dry deposition, Brownian diffusion, Eddy diffusion.

The inertia of particles is the basis of the present model of particle 'dry deposition' from a turbulent fluid. The basic physical concepts of particle thermal motion as described by Einstein were extended to describe the particle motion in nonisotropic turbulence in terms of a 'turbophoretic' velocity. The particle transfer from the turbulent fluid to a collecting black surface was therefore given in terms of a differential motion describing the chain of 'inertial flights' undergone by the particle under the gradient of turbulence velocity component in the direction of the collecting surface. The model of dry deposition shows satisfactory agreement with experimental values of particle deposition velocity as a function of particle size. (Sims-ISWS)
W75-07258

MEASUREMENT OF GROWTH RATE TO DETERMINE CONDENSATION COEFFICIENTS FOR WATER DROPS GROWN ON NATURAL CLOUD NUCLEI,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
A. M. Sinnarwalla, D. J. Alofs, and J. C. Carstens.
Journal of the Atmospheric Sciences, Vol 32, No 3, p 592-599, March 1975. 9 fig, 1 tab, 18 ref. NSF Grant GA-30876.

Descriptors: *Nucleation, *Drops(Fluids), *Growth rates, *Cloud physics, Measurement, *Missouri, Condensation, Meteorology, Diffusion, Laboratory tests, Size, Velocity.
Identifiers: Thermal diffusion chamber, Error analysis, *Rolla(Mo).

Growth rate measurements were made for water drops grown on nuclei in atmospheric air samples taken in Rolla, having a population of 15,000 and very little industry, is relatively free of urban pollutants. The measurements were made in a vertical flow thermal diffusion chamber of supersaturations of 0.5 and 1%. The time to grow from near dry radius to the final radius (6 to 7.5 micrometers) was measured. If one assumes the thermal accommodation coefficient is unity, the measurements indicate an average value of 0.026 for the condensation coefficient. The temperature ranged from 22.5 to 25.7C. (Jones-ISWS)
W75-07259

THREE MODELS FORTHE COALESCENCE GROWTH OF CLOUD DROPS,
Naval Weapons Center, China Lake, Calif.
D. T. Gillespie.
Journal of the Atmospheric Sciences, Vol 32, No 3, p 600-607, March 1975. 6 ref.

Descriptors: *Coalescence, *Model studies, *Drops(Fluids), *Cloud physics, Computer models, Stochastic processes, Clouds, Statistical methods, Statistical models, Physical properties, Growth rates, Meteorology, Model studies.
Identifiers: *Cloud drops, Stochastic coalescence equation.

In an attempt to resolve the confusion over the 'stochastic completeness' of the stochastic coalescence equation, an analysis was made of an idealized cloud consisting of a number of large 'drops' falling through very many small, equal-size 'droplets' with a constant drop-droplet collection kernel. It was shown how three superficially equivalent physical interpretations of the drop-droplet collection kernel lead to three quite different models for the growth of the drops. The implications of and relationships between the model were drawn out in detail. The stochastic completeness controversy was apparently a consequence of a failure to distinguish clearly between two of these three conceptual approaches. The three models are (1) the continuous model, (2) the quasi-stochastic model, and (3) the pure stochastic model. (Jones-ISWS)
W75-07260

THE INFLUENCE OF SNOWCOVER ON THE ATMOSPHERIC CIRCULATION AND ITS ROLE IN CLIMATIC CHANGE: AN ANALYSIS BASED ON RESULTS FROM THE NCAR GLOBAL CIRCULATION MODEL,
National Center for Atmospheric Research, Boulder, Colo.
J. Williams.
Journal of Applied Meteorology, Vol 14, No 2, p 137-152, March 1975. 17 fig, 1 tab, 45 ref.

Descriptors: *Atmosphere, *Circulation, *Computer models, Glaciers, *Snow cover, *Climates, Monsoons, Oceans, Temperature, Winds, Clouds, Moisture, Kinetics, Energy.
Identifiers: Little Ice Age, July.

The NCAR global circulation model was used with boundary conditions representing those of a glacial period July, except that areas in North America, Europe, Asia, and South America, which formerly were glaciated, have no orography change but have an albedo change equivalent to covering the areas with snow. The resuls of the snowcover experiment were compared with those of a July control and a July ice-age case. Reduction of global mean eddy kinetic energy, elimination of the tropical easterly jet, and changes in other climatic variables suggest a weakening of the Northern Hemisphere summer monsoon in the snowcover case compared with the control case. Over North America is a ridge of high mean sea level pressure giving northerly flow over the Hudson Bay-Great Lakes area. At 6 km is a trough of low pressure over eastern North America and a somewhat weaker trough over the British Isles and western Europe. The pole-to-equator temperature gradient increased in the snowcover case when compared with the control case. The Northern Hemisphere jet stream, in zonal average, is stronger and farther south. Cloudiness increased over the snowcover areas compared with the control case; precipitation decreased but not as much as in the ice age case. Results suggest that changes in albedo and ocean surface temperature influence the simulated atmospheric circulation more than changes in orography caused by glaciation. The July snowcover experiment reproduced many of the atmospheric circulation features in the Northern Hemisphere associated with extensive snowcover in summer months, hypotheses regarding the inception of glacierization, and the reconstructed climate of the Little Ice Age (1550-1850 AD). (Jones-ISWS)
W75-07267

OPTICAL LEVITATION OF LIQUID DROPS BY RADIATION PRESSURE,
Bell Labs., Holmdel, N.J.
A. Ashkin, and J. M. Dziedzic.
Science, Vol 187, No 4181, p 1073-1075, March 21, 1975. 2 fig, 4 ref.

Descriptors: *Drops(Fluids), *Radiation, Optical properties, Cloud physics, Aerosols, Light, Electric fields, Clouds, Instrumentation, Coalescence, Fluid mechanics.
Identifiers: *Laser beams, *Levitation, Fluid dynamics, Radiation pressure, Scattering(Light).

Charged and neutral liquid drops in the diameter range from 1 to 40 microns can be stably levitated and manipulated with laser beams. The levitation technique was extended toward smaller particles (about 1 micron), lower laser power (less than 1 milliwatt), and deeper traps (greater than ten times the particle's weight). The technique developed have particular importance in cloud physics, aerosol science, fluid dynamics, and optics. The interactions of the drops with light, the electric field, the surrounding gas, and one another can be observed with high precision. (Jones-ISWS)
W75-07269

THE IMPACTS OF SNOW ENHANCEMENT: TECHNOLOGY ASSESSMENT OF WINTER OROGRAPHIC SNOWPACK AUGMENTATION IN THE UPPER COLORADO RIVER BASIN.
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 3B.
W75-07333

SNOWPACK, CLOUD-SEEDING, AND THE COLORADO RIVER: A TECHNOLOGY ASSESSMENT OF WEATHER MODIFICATION,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 3B.
W75-07334

2C. Snow, Ice, and Frost

DOPPLER RADAR OBSERVATIONS OF A HAILSTORM,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
For primary bibliographic entry see Field 2B.
W75-07049

THE ELECTRICAL ANISOTROPY OF SEA ICE IN THE HORIZONTAL PLANE,
Geophysical Survey Systems, Inc., North Billerica, Mass.
K. J. Campbell, and A. S. Orange.
Journal of Geophysical Research, Vol 79, No 33, p 5059-5063, November 20, 1974. 6 fig, 7 ref.

Descriptors: *Sea ice, *Ice, Measurement, Instrumentation, Radar, *Anisotropy, Ice-water interfaces, Physical properties, *Canada, *Arctic, Electrical properties.
Identifiers: *Electrical anisotropy.

Sea ice electrical anisotropy in the horizontal plane was observed with an impulse radar technique under development for profiling ice thickness. The radar technique used can be considered the electromagnetic equivalent of acoustic subbottom profiling methods. The anisotropy phenomenon was characterized by a marked change in amplitide of the vertically propagated signal reflected from the sea ice/water interface as the linerarly polarized antenna was rotated in the horizontal plane on or above the ice surface. Anisotropy for both first-year and multiyear sea ice was observed in several areas of the Canadian Arctic. Additional experimental work is necessary to determine the nature of the anisotropy mechanism. (Sims-ISWS)
W75-07055

HAIL AND RAINDROP SIZE DISTRIBUTIONS FROM A SWISS MULTICELL STORM,
Eidgenoessische Technische Hochschule, Zuerich (Switzerland).
For primary bibliographic entry see Field 2B.
W75-07056

ICE SHELVES AND ICE FLOW,
Scott Polar Research Inst., Cambridge (England).
G. de Q. Robin.
Nature, Vol 253, No 5488, p 168-172, January 17, 1975. 2 fig, 16 ref.

Descriptors: *Glaciers, *Ice cover, Movement, *Velocity, *Antarctic, Remote sensing, Aircraft, Radar, Surveys, Measurement, Glaciology, Icebergs.
Identifiers: Ice shelves, Ice flow, *Ross Ice Shelf.

Of the 13,800,000 sq km of ice covering Antarctica, some 12,100,000 sq km lie on a rock base, while about 1,500,000 sq km are in the form of floating slabs of ice round the periphery of the continent. The largest of these is the Ross Ice Shelf. To provide the first data for planning the Ross Ice Shelf Project, extensive airborne soundings of the ice shelf were made. A new map of the thickness of the Ross Ice Shelf was based on profiling of the ice thickness by radio echo sounding from aircraft. Streamlines of ice flow were deduced from the thickness pattern and extrapolation of velocities upstream by the assumption of mass continuity. These data provide an insight into the importance of the momentum with which an ice stream enters the shelf for the overall velocity field. (Sims-ISWS)
W75-07059

RAINFALL AND SNOWMELT RUNOFF FROM INTERMEDIATE ELEVATION WATERSHEDS,
For primary bibliographic entry see Field 2A.
W75-07101

TEMPERATURE FIELD AND HEAT FLOW IN SNOW COVER,
M. A. Dolov, and M. Ch. Zalikhanov.
Available from the National Technical Information Service, Springfield, Va 22161 as TT-71-51011, $3.25 in paper copy, $2.25 in microfiche. TT 71-51011, 1974, 16 p, 3 fig, 5 tab, 7 ref. Translated from Trudy Nauchno-Issledovatelskogo Gidrometeorologicheskogo Instituta, No 22, p 178-186, 1966.

Descriptors: *Snow cover, *Temperature, *Heat flow, Snow, Snowpacks, Heat transfer, Thermal conductivity, Thermal properties.

Temperature distribution in snow cover and heat exchange of snow with the surrounding medium were studied for dry and wet snow. A very thick snow layer was broken into two and the temperature distribution and heat flow under these conditions were studied separately. The influence of the density of snow on its heat exchange with the surrounding medium was studied by molecular heat conductivity. Heat exchange between the snow cover and air actually depends on the density of snow and the range of temperature variation of the snow surface. Comparison of the heat flow of dry and wet snow of the same densities and temperature variations on the snow surface showed that heat flow in dry snow is approximately 20-30% less than that in wet snow. (Sims-ISWS)
W75-07170

ICE CLOUDS AT THE SUMMER POLAR MESOPAUSE,
National Oceanic and Atmospheric Administration, Boulder, Col. Aeronomy Lab.
For primary bibliographic entry see Field 2B.
W75-07257

THE INFLUENCE OF SNOWCOVER ON THE ATMOSPHERIC CIRCULATION AND ITS ROLE IN CLIMATIC CHANGE: AN ANALYSIS BASED ON RESULTS FROM THE NCAR GLOBAL CIRCULATION MODEL,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W75-07267

THE IMPACTS OF SNOW ENHANCEMENT: TECHNOLOGY ASSESSMENT OF WINTER OROGRAPHIC SNOWPACK AUGMENTATION IN THE UPPER COLORADO RIVER BASIN.
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 3B.
W75-07333

2D. Evaporation and Transpiration

AN INSTRUMENT SYSTEM FOR ESTIMATION OF EVAPOTRANSPIRATION BY THE EDDY CORRELATION METHOD,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife, and Range Sciences.
G. H. Belt, J. King, and E. Bailey.
Idaho Forest, Wildlife and Range Experiment Station, Station Paper Nov. 19, 16 p, December, 1974. 12 fig, 2 tab, 5 ref.

Descriptors: *Evapotranspiration, *Instrumentation, *On-site data collections, *Eddies, *Meteorological data, Anemometers, Humidity, Air temperature, Data collections, Forests, Calibrations, Electronic equipment, Remote sensing, Condensation, Hygrometry, On-site tests, Wind velocity, Air circulation.
Identifiers: Gill-type propeller anemometers, Brady-array humidity sensors, Metro-Data digital tape recorder.

A fast-response meteorological instrument system for measuring parameters used in calculating evapotranspiration above a forest stand is described. Comprised of Gill-type propeller anemometers, Brady-array humidity sensors, thermistor air-temperature sensors, and a Metro-Data digital tape recorder, the system was designed to measure eddy fluctuations in the range from 1 to 0.005 cycles/second. Details of signal conditioning circuitry for the Brady-array are presented along with a discussion of apparatus and techniques employed to calibrate the sensors as part of the instrument system. Problems with electrical noise and condensation within instrument packages which occurred during field trials are also discussed. (Witt-IPC)
W75-06894

THE EFFECT OF CONIFERS ON THE CHEMISTRY AND MASS BALANCE OF TWO LARGE LYSIMETERS IN CASTRICUM (THE NETHERLANDS),
Food and Agriculture Organization of the United Nations, Kitale (Kenya). Turkana Irrigation Project.
H. Ryckborst.
Journal of Hydrology, Vol 24, No 1/2, p 77-87, January 1975. 10 fig, 1 tab, 6 ref.

Descriptors: *Conifers, Chemistry, *Lysimeters, Drainage water, Dune sands, Rainfall, Vegetation, Infiltration, Evapotranspiration, Hydrogen ion concentration, Rain water, Water balance.
Identifiers: *Netherlands(Castricum).

A comparison of the quality of drainwater from dunesand in a bare lysimeter and in a lysimeter with growing conifers showed significant differences. Over a period of 16 years the vegetated lysimeter plot intercepted 24% more C1(-), SO4(-) and Na(+) + K(+) ions from rainwater and aerosols than the bare plot. On the other hand, the conifers reduced the average output of Ca(++) and Mg(++) in drainwater by 13% and the total amount of NO3(-) in drainwater was reduced by a factor of 20. The pH value of drainwater decreased during periods of rainfall, while large amounts of Ca(++) and HC):(-) were leached out. The percentage of the rainfall that infiltrated through the bare sandy soil remained constant at 80% during 16 years. In contrast, the vegetated lysimeter drained 62% of the rain during its first year of operation. Thereafter a continuing decrease occurred over a period of 7 years, coinciding with increased growth and evapotranspiration of the conifers. After 7 years, the decrease in volume of recharged rainwater leveled off to 25% of the rainfall. From that period, the conifers did not grow nearly as well as the surrounding trees with free access to groundwater. (Roberts-ISWS)
W75-07052

EFFECTS OF ROOT MEDIUM AND WATERING ON TRANSPIRATION, GROWTH AND DEVELOPMENT OF GLASSHOUSE CROPS: III. EFFECT OF WATERING-FACTOR AND VOLUME OF ROOT MEDIUM ON YIELD AND QUALITY OF GREENHOUSE TOMATOES,
State Experiment Station Landvik, Grimstad (Norway).
G. Guttormsen.
Plant Soil. Vol 40, No 3, p 479-492. 1974, Illus.

Descriptors: *Tomatoes, Crops, Field crops, *Plant growth, Water greenhouses, *Water requirements, Peat, *Soil amendments, *Plant growth regulators, *Soil-water-plant relationships.

The effect of various watering factors and of peat volume on the growth and development of greenhouse tomatoes was investigated in 2 factorial experiments. The water-factors were determined on the basis of evaporation from a free water surface, where mm of water added/mm of evaporation = watering-factor. The watering-factors 1, 1.5, 2, 3 and 4.5 were combined with 14, 28 and 42 dm3 of peat/plant. The plants were grown under conditions which gave relatively much drainage water. An additive effect of watering-factor and volume was observed. The total yield and the size of the fruit were greatest with watering-factor 2-3. The effect of increase in volume was greatest between 14 and 28 dm3 of peat/plant. The main tendency was to a positive correlation between the total yield or fruit weight and the number of fruits with blotchy ripening or brown vascular bundles. The number of fruits with imperfect form was positively correlated with the number of hollow fruits and with the weight of the fruits. There was a positive correlation between weight of the fruit and hollowness. Moreover, there was a negative correlation between the number of perfect fruits and the total production, and between perfect friuts and the weight of the fruits. It was possible to use automated watering and peat in a standardized growing method of tomatoes.--Copyright 1974, Biological Abstracts, Inc.
W75-07053

THE DEPENDENCE OF BARE SOIL ALBEDO ON SOIL WATER CONTENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W75-07062

SPATIAL AND TEMPORAL VARIATIONS OF THE TURBULENT FLUXES OF HEAT, MOMENTUM, AND WATER VAPOR OVER LAKE ONTARIO DURING IFYGL,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
B. R. Bean, C. B. Emmanuel, R. O. Gilmer, and R. E. McGavin.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, as C55.13: ERL 313-WMPO 5. NOAA Technical Report ERL 313-WMPO 5, February 1975, 62 p.

Descriptors: *Lakes, *Air-water interfaces, *Evaporation, *Temperature, *Water vapor, *Winds, Water balance, Water loss, Air masses, Climatology, Meteorology, Weather, Air temperature, Heat, Heat balance, Water circulation, Upwelling, *Lake Ontario.
Identifiers: Time series, Turbulent flux quantities, Eddy correlation technique, Lake surface temperature.

During the 1972 IFYGL 'alert' periods, the highly instrumented NOAA/RFF/DC-6 aircraft was used to record the time series of wind, temperature, and water vapor at heights ranging from 18 to 300 m above the surface of Lake Ontario. The time series records have been found to display a highly intermittent nature. This is especially the case for evaporation. IR lake surface temperatures show cold regions along the north shore, presumably due to strong upwelling, while the center and south shore regions of the lake were of the order of 12 to 15 C. The turbulent, flux quantities of momentum, heat, and water vapor were obtained by the eddy correlation technique and their spectra were determined at several locations over the lake surface for 3-minute sampling lengths. (NOAA)
W75-07080

EFFECT OF ROOT MEDIUM AND WATERING ON TRANSPIRATION, GROWTH AND DEVELOPMENT OF GLASSHOUSE CROPS: II. THE RELATIONSHIP BETWEEN EVAPORATION PAN MEASUREMENTS AND TRANSPIRATION IN GLASSHOUSE CROPS,
State Experiment Station Landvik, Grimstad (Norway).
G. Guttormsen.
Plant Soil. Vol 40, No 3, p 461-478, 1974, Illus.

Descriptors: Evaporation, Transpiration, *Plant growth, Crops, Field growth, *Tomatoes, *Water requirement, *Evaporation pans.
Identifiers: Glasshouse crops, Paprika.

The investigation was carried out under conditions approximating those obtained for crops grown on a commercial scale. The plants (tomatoes and paprika) were grown in peat with an abundant water supply. Evaporating pan measurements (E sub e) were an adequate expression for the water consumption, calculated on a 24-h basis. The E sub T(transpiration)/E sub e ratio for a 5-mo. growing season was 1.2 for tomatoes and 0.9 for paprika when E sub e was measured 50 cm above the crop canopy. For tomatoes the E sub T/E sub e ratio increased somewhat throughout the season because of the increase in the leaf area at the beginning of the season and later because of the increased ventilation through the crop brought about

by a decrease in leaf area density. The removal of the flower clusters increased both the vegetative growth and the root growth. It had no significant effect on E sub T. The influence of the plant factors on transpiration is of relatively minor importance in regard to the relationship between optimal water supply and E sub e, when cultivation is carried out in porous media with a sufficient supply of water, and under glasshouse conditions.--Copyright 1974, Biological Abstracts, Inc.
W75-07153

PROCEDURES FOR EVALUATING THE SURFACE WATER BALANCE OF GRAN CANARIA,
United Nations Development Program, Las Palmas de Gran Canaria (Spain).
L. E. Ahlgren, and H. J. Van Der Zel.
Nordic Hydrology, Vol 5, No 4, p 229-246, 1974. 10 fig, 3 tab, 4 ref.

Descriptors: *Surface waters, *Evapotranspiration, *Water balance, Precipitation(Atmospheric), Runoff, Hydrology, Geologic formations, Recharge, Evaluation, Atlantic Ocean.
Identifiers: *Gran Canaria, Potential evapotranspiration, Class A pan evaporation.

Standard procedures were modified to fit local conditions in order to evaluate the surface water balance in Gran Canaria, a volcanic island 200 km off the west coast of Africa at latitude 28 degrees N. With a bookkeeping method, the terms of the balance equation were calculated on a daily basis. Precipitation was based on data from a limited number of representative stations. Runoff data were extrapolated by quantifying the characteristics of the geological formations by the SCS curve number method. Potential evapotranspiration data based on Class A pan measurements or Penman calculations were extrapolated by using the Blaney-Criddle method. Real evapotranspiration was calculated by using the Thornthwaite-Mather hypothesis. The results of this simplified procedure coincided well with the results of an independent evaluation of the recharge. (Roberts-ISWS)
W75-07194

EVAPOTRANSPIRATION AND PLANT PRODUCTION DIRECTLY RELATED TO GLOBAL RADIATION,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
H. C. Aslyng.
Nordic Hydrology, Vol 5, No 4, p 247-256, 1974. 5 fig, 16 ref.

Descriptors: *Evapotranspiration, *Radiation, Plant breeding, Regression analysis, Productivity, Plant growth, Latent heat, Lysimeters, Soil-water-plant-relationships, Vegetation.
Identifiers: *Global radiation, Net radiation.

This paper was based on the thesis that when sun radiation is not in excess and advected energy supply can be neglected, then for periods of plant cover and growth, both evapotranspiration and plant production are linearly and strongly related to global radiation. The regression coefficients will depend also on plant, soil, and other climatic factors, but global radiation is the dominating factor for potential evapotranspiration and potential plant production in given regions. Under comparable conditions different plant species and strains will result in different regression coefficients due to differences in genetic abilities. Potential evapotranspiration determined by a soil water balance study of well-developed and growing crops and by the Penman method was found to be strongly correlated even for daily values. The dry matter yield of a grass crop was found to be a linear function of global radiation throughout the growth period May to October. For each cutting, about 5 kcal/sq cm was found to be ineffective due to insufficient leaf cover. Cutting intervals of 4 weeks gave a lower total yield than intervals of 6 weeks. (Roberts-ISWS)
W75-07195

EVAPORATION DUE TO SPRAY,
Delaware Univ., Newark. Coll. of Marine Studies.
J. Wu.
Journal of Geophysical Research, Vol 79, No 27, p 4107-4109, September 20, 1974. 1 fig, 1 tab, 8 ref.

Descriptors: *Evaporation, *Sprays, *Drops(Fluids), Winds, Waves(Water), Wind velocity, Laboratory tests, Heat balance, Boundary layers, Laminar flow, Turbulent flow, Humidity.
Identifiers: *Wind-wave tank, Laser, Phototransistor.

Evaporation due to spray produced in a laboratory wind-wave tank was calculated from the measured droplet concentration and was found to increase drastically with wind velocity. A laser and phototransistor unit was used with a tank 1.5 m wide and 14 m long. An axial flow fan was installed at the upwind end and a permeable wave absorber located at the downwind end. The test section was at the middle length position. The tank was covered for the first 8 m to provide a 0.35-m deep air passage above 1.2-m deep water. The wind velocity near the water surface was found to vary logarithmically with the elevation above the mean water surface. The airflow boundary layer completed its transition from laminar to turbulent at the wind velocity of 2 m/s and became aerodynamically rough when the wind velocity in the tunnel was 14 m/s; intensive spray was initiated at a wind velocity of 9 m/s. The contribution of water vapor in the atmosphere surface layer from spray evaporation increased by more than 2 orders of magnitude over the narrow velocity range of the experiment. It appeared that evaporation would be mainly from droplets when the wind velocity is greater than 15 m/s. (Roberst-ISWS)
W75-07197

ESTIMATES OF TEMPERATURE AND PRECIPITATION FOR NORTHEASTERN UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4A.
W75-07241

A MEASUREMENT OF ALBEDO CHANGES RESULTING FROM AFFORESTATION PRACTICES,
Institute of Hydrology, Wallingford (England).
A. J. B. Baty, J. C. Rodda, and R. F. Templeman.
Hydrological Sciences Bulletin, Vol 18, No 4, p 451-458, December 1973. 3 fig, 2 tab, 12 ref.

Descriptors: *Albedo, *Evaporation, *Forest management, Radiation, Heat balance, Environmental effects, Meteorology, Instrumentation, Electronic equipment, Solar radiation, Watersheds(Basins), Forest watersheds, On-site investigations, Small watersheds.
Identifiers: Solarimeters, *United Kingdom(England).

The measurement of albedo by portable battery-powered recorders before and after the ploughing of drainage ditches by the Forestry Commission on a small catchment in northern England was described. The change in the evaporation brought about by the reduction of the mean basin albedo from 15.2 plus or minus 0.7% to 13.1 plus or minus 0.8% would not in itself produce a significant change in the basin's hydrological behaviour. (Sims-ISWS)
W75-07265

2E. Streamflow and Runoff

MEAN ANNUAL RUNOFF IN THE SAN FRANCISCO BAY REGION, CALIFORNIA, 1931-70,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-06936

THE USE OF STREAMFLOW MODELS IN PLANNING,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
For primary bibliographic entry see Field 6A.
W75-06949

RIVER AND ESTUARY MODEL ANALYSIS, VOLUME 3.
Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand. 488 p. (1973).

Descriptors: *Conferences, *Hydraulic models, *Mathematical models, *Model studies, Rivers, Channels, Sediment transport, Estuaries, Floods, Flood plains, Hydrology, Water quality, Flood routing, Analog models, Inlets(Waterways), Surface waters, Flow Dispersion, Numerical analysis, Unsteady flow, Tidal streams, Tidal waters.
Identifiers: *River mechanics, Fixed bed models, Movable bed models.

River mechanics was discussed at a symposium held at Bangkok in 1973. The two broad topics discussed in Volume 3 were: (1) hydraulic modeling, and (2) mathematical modeling. (See W75-06999 thru W75-07037) (Humphreys-ISWS)
W75-06998

SIMULATION OF SEDIMENT TRANSPORT IN HYDRAULIC MODELS,
Technische Universitaet, Obernach (West Germany). Versuchsanstalt fuer Wasserbau-Oskar von Miller-Institut.
For primary bibliographic entry see Field 2J.
W75-06999

RIVER MODELS WITH A MOVABLE BED,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-07000

THE TIDAL REGIME OF THE ELBE-RIVER, HYDRAULIC MODEL WITH MOVABLE BED,
Bundesanstalt fur Wasserbau, Hamburg (West Germany).
For primary bibliographic entry see Field 2L.
W75-07001

A SMALL SCALE HYDRAULIC MODEL IN MARINE TRANSPORTATION STUDIES,
Canadian Marine Transportation Administration, Ottawa (Ontario).
For primary bibliographic entry see Field 2L.
W75-07002

STUDIES FOR CHALNA PORT IN THE DELTA OF GANGES RIVER,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia). Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W75-07003

LARGE MATERIAL MODELS IN WATERSHED HYDROLOGY RESEARCH,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2A.
W75-07004

COMBINATION OF A PHYSICAL AND A MATHEMATICAL RIVER MODEL WITH FIXED BED,
Bundesanstalt fuer Wasserbau, Karlsruhe (West Germany).
H. Dorer.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 75-83. (1973). 5 fig.

Descriptors: *Model studies, *River regulation, *River training, Hydraulic models, Mathematical models, Equations, Rivers, Navigation, Roughness coefficient.
Identifiers: *Federal Republic of Germany(River Rhine), Fixed bed model.

By combining a physical and a mathematical model, it is possible to do the model investigations in a shorter time and with lower costs than by using a physical model only. With a part of the River Rhine as an example, the mathematical model was described. The results both of the mathematical and the physical model were given for two examples. The mathematical model based upon the one-dimensional equation for gradually varied steady flow proved to be a useful method of investigation, even in cases of complicated flow conditions. By combining a mathematical and a physical model the efficiency of the model investigations, concerning a part of the Rhine with the aim of obtaining better conditions for navigation, was improved. It was possible to study a number of possible solutions of the river geometry in the mathematical model more quickly and at much lower costs than in the physical model. The solution obtained by the mathematical model proved to be quite near the final solution, only some little improvements being necessary in the physical model. (See also W75-06998) (Humphreys-ISWS)
W75-07005

RIVER SIMULATION BY CHANNEL NETWORK ANALYSIS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
N. L. Ackermann, and C-K. Chang.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 85-96. (1973). 6 fig, 1 tab, 3 ref.

Descriptors: *Model studies, *Rivers, *Analytical techniques, *Simulation analysis, Mathematical models, Open channels, Channel improvement, Stream improvement, Numerical analysis, Discharge(Water), Roughness coefficient, Networks, Navigation, Hydraulics.
Identifiers: *Laos(Mekong River), Channel network analysis.

An iteration procedure, somewhat similar to that used in the analysis of pipe networks, was developed to predict flow conditions in a system of interconnecting open channels. This procedure was used to study the flow in the Mekong River throughout a broad, shallow reach 2 kilometers in length where the river flows around numerous islands and submerged rock formations. The river was modeled as a system of interconnecting channels, the geometry of which was determined from data obtained from hydrographic surveys. Changes in the river geometry which were required to produce improved navigation conditions could be simulated in the model by making corresponding mathematical changes to the geometry of the channel network. The effects of planned channel improvements were computed and compared to results obtained from a hydraulic model investigation. The hydraulic characteristics of a broad shallow reach of the Mekong River was simulated by a system of interconnecting channels. (See also W75-06998 (Humphreys-Isws))
W75-07006

DETERMINATION OF DISCHARGE SCALE FOR A TIDAL MODEL OF A COMPLEX RIVER,
Irrigation and Power Research Station, Poondi (India).
For primary bibliographic entry see Field 2L.
W75-07007

SOME NOTES ON HYDRAULIC MODEL TESTS OF RIVER CHANNELS,
Public Works Research Inst., Kashima (Japan). Kashima Hydraulics Lab.
K. Suga.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 109-120. (1973). 5 fig, 2 tab, 4 ref.

Descriptors: *Hydraulic models, *Rivers, *Hydraulic similitude, Model studies, Calibrations, Channels, Scour, Sediment transport, River training, Channel improvement, Laboratory tests, Analytical techniques.
Identifiers: Fixed bed models, Movable bed models, Distorted models.

The problem of similarity laws for fixed and movable beds, new examination methods for verification of physical modeling, the methods for experiment planning, and other important matters obtained from experiences were described. For example, the special care in which the surface velocity distribution measured by aerial photography during a large flood was used for verification of the model, determination method for time scales of movable bed models by measuring the rates of sediment transport both at actual river and fundamental two dimensional channel, fundamental study on the effects of distortion of the models especially at curved reaches, and the effect of roughness of sidewall on the local erosion were discussed. From the view point of actual performance of model tests, general experimental techniques developed at Kashima Hydraulics Laboratory were presented. The results of experiments have been applied to the designs of actual river channels with favorable results. Studies on development of new bed materials and experiment methods for rivers which have few fields data were recommended. (See also W75-06998) (Humphreys-ISWS)
W75-07008

MODELING AND ANALYSIS OF FLOODS THROUGH FLOOD PLAINS,
California State Univ., Sacramento. Dept. of Civil Engineering.
A. L. Prasuhn.
In: River and Estuary Model Analysis, Volume III; Proceedings of the Internationl Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 121-132. (1973). 5 fig, 3 tab, 1 ref.

Descriptors: *Model studies, *Flood plains, *Rivers, Flood stages, Overflow, River flow, Overland flow, Banks, Flood flow, Hydraulic models, Hydraulics, Laboratory tests, Roughness coefficient, Orchards, Trees, Analysis, Roughness(Hydraulic), Land use, *California.
Identifiers: Hedgerows.

A model study was undertaken to evaluate the hydraulic effects of increased tree concentrations in orchards planted on the overbank portions of river systems. Procedures were developed to predict the resulting river depth and resistance adjustments based on the flood plain model data. It was found that the relationship between flood depth and tree height was of primary importance. On the basis of these tests the State of California Reclamation Board revised its standards from the previously rigid 22 by 22 ft square configuaration to a more flexible policy whereby each request is considered on an individual basis taking into account the relative height of trees to the elevation of the top of the levee (i.e., design stage), the proportion of main channel to overbank area, and the proposed direction of tree rows. When these conditions are favorable, the proposed hedgerows with higher tree concentrations are permitted. (See also W75-06998) (Humphreys-ISWS)
W75-07009

HYDRAULIC MODELING OF UNSTEADY FLOWS OF THE MEKONG RIVER,
Asian Inst. of Tech., Bangkok (Thailand), Div. of Water Science and Engineering.
P. Thimakorn, N. L. Ackermann, and S. Pinkayan.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 133-145. (1973). 9 fig, 3 ref.

Descriptors: *Hydraulic models, *Unsteady flow, *Rivers, Model studies, Hydrographs, Discharge(Water), Floods, Streamflow, Flood plains, Flood stages, Calibrations, Theoretical analysis, Equations, Continuity equation, Momentum equation, Froude number, Reynolds number, Overflow, Banks.
Identifiers: *Laos(Mekong River).

A hydraulic model study was conducted to determine the effects of dike construction on flood levels of the Mekong River in the Vientiane plain, Laos. Only the model calibration was discussed. The horizontal and vertical length scales of the model were 1:10,000 and 1:100, respectively. The scales were selected to minimize the laboratory floor space required to model 2000 square kilometers of the flood plain bordering the Mekong River in the vicinity of Vientiane. The modeling criteria for determining the discharge and time scales were based on Froude similarity. The length scales were selected to maintain Reynolds numbers in the model in excess of 1400 throughout the region of overbank flow and to insure that model instrumentation should not require measurement of changes in the water surface elevation to be more precise than 1/2 mm. Excellent results of model calibration were obtained in spite of the small model scales which were selected. (See also W75-06998) (Humphreys-ISWS)
W75-07010

AN APPROACH TO THE MODELING OF THE MEKONG AT PHNOM PENH,
Makerere Univ., Kampala (Uganda). Faculty of Technology.
S. Bruk.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 147-157, (1973). 2 fig.

Descriptors: *Planning, *Model studies, *Rivers, Investigations, Programs, Bank erosion, Floods, River regulation, Hydraulic models, Junctions.
Identifiers: *Cambodia(Mekong River).

The Mekong near Phnom Penh is divided into three branches, one of which, depending upon the stages, has a reversible flow. The four-branched river junction is in continuous downstream movement which is a major obstacle to the development of the town. The creation of stable river morphology thus becomes a task of hydraulic engineering. Some aspects of the approach to this problem were discussed. The character of necessary

hydraulic research was examined in anticipation of the future engineering works. Possible methods of investigation were discussed and some general aspects were underlined by pointing out that successful model studies require a clear and distinct definition of the engineering problem to be solved, a sufficient knowledge of the physical parameters, and an appropriate choice of economically justified research methods. (See also W75-06998) (Humphreys-ISWS)
W75-07011

HYDRAULIC PROBLEMS OF THE MEKONG RIVER IN THE QUATRE-BRAS REACH,
Vyzkumny Ustav Vodohospodarsky, Bratislava (Czechoslovakia).
J. Komora, and A. Sikora.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 159-170, (1973). 3 fig, 1 tab, 10 ref.

Descriptors: *Floods, *Rivers, *Sediment transport, Bed load, Junctions, Streamflow, Water levels, River training, Sediment discharge, On-site investigations, Evaluation.
Identifiers: *Cambodia(Mekong River).

The Mekong River in the reach of the Quatre Bras forms a rather complex junction which influences the hydraulic regime of the Mekong Delta. From published hydrological data, the basic hydraulic changes were evaluated on the four branches during the flood periods. Those changes are due to the small slope of the river and complicated flow. The effect of the envisaged barrage construction on the Tonle Sap upon the morphological changes of the river bed in the Quatre Bras reach was considered. These evaluations as well as direct measurements in the field were made to prepare for the construction of the Quatre Bras model. (See also W75-06998) (Humphreys-ISWS)
W75-07012

THE INFLUENCE OF TIDAL INLET CURRENTS ON THE PROPAGATION OF WAVE ENERGY INTO ESTUARIES - PHYSICAL MODEL INDICATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2L.
W75-07013

ON AN EFFECT OF RIVER DISCHARGE TO TSUNAMI IN A MODEL OF URADO BAY,
Kyoto Univ. (Japan). Disasters Prevention Research Inst.
For primary bibliographic entry see Field 2L.
W75-07014

MODEL SIMULATION OF THE DOWNSTREAM EFFECTS OF OPERATING THE SIRIKIT POWER STATION,
Electricity Generating Authority of Thailand, Nonthaburi. Planning Dept.
For primary bibliographic entry see Field 8B.
W75-07015

SYSTEM 11 'SIVA', A DESIGN SYSTEM FOR RIVERS AND ESTUARIES,
Technische Hogeschool, Delft (Netherlands). International Courses in Hydraulics.
M. B. Abbott, G. S. Rodenhuis, and A. Verwey.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 207-213, (1973). 6 ref, 2 append.

Descriptors: *Model studies, *Design, *Rivers, *Estuaries, *Systems analysis, Mathematical models, Equations, Computer models, Forecasting, Floods, Water pollution, Water quality, Distribution patterns, Water management(Applied), River basins, Flow, *Computer programs.
Identifiers: One-dimensional flow, One-layer fluid.

A design system is an ensemble of computer routines organized into a single program-documentation entity that can build any model of a particular type and run this model when presented only with the topographical description of the model and the initial and boundary data. The System 11, 'Siva,' of the Computational Hydraulics Centre in Copenhagen, is such a design system, capable of constructing mathematical models of any one-dimensional flow of a one-layer (vertically homogeneous) fluid. It can be used to model rivers, estuaries, fjords, certain lakes, and similar bodies of water, with the objectives of forecasting floods or pollution levels or for various other purposes of river basin management. Partial differential equations upon which System 11 is based were given. Applications of System 11, 'Siva' were discussed. (See also W75-06998) (Humphreys-ISWS)
W75-07016

THE APPLICATION OF RIVER SYSTEM MECHANICS,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
Y-S. Fok.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 215-226, (1973). 15 ref.

Descriptors: *River systems, *Systems analysis, *Model studies, Dynamics, Channel morphology, Erosion, Rivers, River basins, Meanders, Travel time.
Identifiers: *River mechanics, Statics, Kinematics, Hydraulic geometry, Stream order.

River system mechanics offers a systematic classification of the important parameters of a river system based on the basic dimensions involved. Equations of the statics, kinematics, and dynamics of the river system mechanics were presented in this sequence so that the nature of applications of these three areas of studies can be understood. All the equations presented were developed from a statistical method, therefore, each equation has its empirical constants which can be evaluated from measured data. The usefulness of the frequency of occurrence as an index to show the flow conditions in time was shown in many examples of application of the kinematics and dynamics of river system mechanics. However, since the frequency of occurrence is derived from the probabilistic process of the hydrological data, the sequential characteristics of such data were ignored. It was suggested that the stochastic process of hydrological data should be used to replace the probabilistic process, so that a time series may be incorporated to the kinematic or dynamic equations and the flow conditions can be predicted. Examples of river system studies discussed included: (1) stream-ordering systems for statics; (2) time of travel, and reaeration capacity for kinematics; and (3) river meanders, erosion rate, and dissolved load for dynamics. (See also W75-06998) (Humphreys-ISWS)
W75-07017

ANALOG, DIGITAL AND HYBRID SIMULATION OF WATER LEVEL DISTRIBUTION IN OCCURRENCES OF FLOODS IN A SYSTEM RIVER FLOOD PLAIN,
Technische Universitaet, Hanover (West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
P. Homagk, and R. Mull.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 227-237, (1973). 5 fig, 7 ref.

Descriptors: *Model studies, *Flood stages, *Hybrid computers, Rivers, Floods, *Water levels, Analog models, *Computer models, Theoretical analysis, Flood plains, Simulation analysis, Distribution.

Manning's formula was applied to simulation of water flow in a quasi one-dimensional system of a river and its flood plain. The greatest deviation between the simulated water level distribution by analog and digital procedures was about 10 cm. There were two main reasons for the differences: (1) the mesh size (40 m) of the digital procedure was half the size used in the analog model (80 m) and (2) on the analog network all resistances were changed only 5 times, whereas 13 steps were necessary for the digital procedure with an over-relaxation factor 1.41 to get a difference of less than 1 cm between the calculated water levels of the 13th and 14th step. A better result was expected with variable mesh sizes. As a result of these investigations, a hybrid simulator was constructed to solve steady and nonsteady flow problems. The computer is an RC-network of variable resistances and capacitances. A processor adjusts the units according to a given characteristic. To measure voltages and to change resistances, an adequate interface connects the analog and the digital components. (See also W75-06998) (Humphreys-ISWS)
W75-07018

DESIGNING BY OBJECTIVES, A SIMULATION STUDY ON THE RIVER YOM IN NORTHERN THAILAND,
MacDonald (Murdoch) and Partners, London (England).
For primary bibliographic entry see Field 4A.
W75-07019

THE STOCHASTIC METHOD IN RIVER MECHANICS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
C-L. Chiu, and T. S. Lee.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 251-262, (1973). 2 fig, 9 ref. NFS Grant GK 30845.

Descriptors: *Model studies, *Stochastic processes, *River beds, Statistical models, Mathematical models, Equations, Shape, Rivers, Simulation analysis, Sediment transport, Roughness(Hydraulic), Velocity, Depth, Cross-sections, Hydrographs.
Identifiers: *Transport processes, River mechanics, River geometry.

A stochastic method of analyzing, modeling, and simulating irregular cross sections of a river was reported, which has proved adequate in case studies. A parameter, K, found from the stochastic analysis and case studies, was presented as the roughness index of irregular bed forms of a river and as the generator of the variances, for given simulation intervals, of stochastic variables which are building blocks of irregular river cross sections to be simulated. K was defined as K squared = 1/2 of 'diffusion coefficient' in one-dimensional diffusion equation or K = h sub w/square root of L, where L sub w is height of bed form and L is length of bed form. Emphasized was the concept of using quantities associated with the stochastically simulated river cross sections as inputs to the deterministic, hydrodynamic systems (equations)

of transport processes. Such a coupling of the stochastic and deterministic techniques enables the utilization of their combined strength while complementing their individual weaknesses. (See also W75-06998) (Humphreys-ISWS)
W75-07020

FLOOD-ROUTING IN NON-PRISMATIC CHANNELS USING AN IMPLICIT METHOD OF SOLUTION,
Liverpool Univ. (England). Dept. of Civil Engineering.
A. R. Halliwell, and M. Ahmed.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 263-274, (1973). 5 fig, 4 ref.

Descriptors: *Flood routing, *Gradually varied flow, *Open channel flow, Mathematical studies, Equations, Unsteady flow, Finite element analysis, Analysis, Analytical techniques, Continuity equation, Momentum equation, Numerical analysis, Open channels, Flood stages, Flood profiles.
Identifiers: Nonprismatic channels, Implicit method.

The one-dimensional equations of gradually-varied unsteady flow in nonprismatic open channels were presented and discussed. The equations were numerically integrated with the aid of an implicit scheme. Approximations to the equations were made with a centered finite-difference technique which resulted in a series of nonlinear simultaneous equations. These were solved by the generalized iteration method of Newton. In order to study the passage of flood waves along a number of different channels, a program was written in Fortran for use with the KDF 9 electronic digital computer. Simple prismatic channels were considered to test the program and the numerical scheme. Examples of converging and diverging channels were given. When compared with water depths in prismatic channels, the depth increased for converging channels and decreased for diverging channels. (See also W75-06998) (Humphreys-ISWS)
W75-07021

MATHEMATICAL MODEL OF MEKONG RIVER NEAR VIENTIANE AND NONGKHAI,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
S. Pinkayan, N. L. Ackermann, and T. Tingsanchali.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 291-302, (1973). 7 fig, 1 ref.

Descriptors: *Model studies, *Floods, *Rivers, *Mathematical models, Hydrographs, Calibrations, Overflow, Flood plains, River flow, Flood stages, Numerical analysis, Return flow, Water levels.
Identifiers: *Mekong River(Laos-Thailand).

The water surface elevations produced by flood flows in the Mekong River near Vientiane, Laos, and Nongkhai, Thailand, were mathematically simulated. The flow in the main channel was determined by a numerical solution of the unsteady free surface flow equations. Spatially varied discharges resulting from overbank flows both into and out of the main channel were considered. The overbank spill into the flood plain was determined by using a modified weir equation in which the lateral discharge was proportional to the 3/2 power of the difference in the elevations between the water level in the main channel and the river bank. The return flow was considered as a function of the storage in the flood plain. This functional relationship which characterized the flood plain was determined empirically from model calibration. Flows resulting from severe floods in the Mekong River which occurred in 1966 and 1971 were simulated. A reasonable agreement existed between the computed and observed water surface elevations. (See also W75-06998) (Humphreys-ISWS)
W75-07023

MODELING RIVER AND ESTUARY UNSTEADY FLOW SYSTEMS,
Utah State Univ., Logan. Dept. of Civil Engineering.
C-L. Chen, and M-S. Chu.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 303-314, (1973). 2 fig, 25 ref.

Descriptors: *Rivers, *Estuaries, *Model studies, *Finite element analysis, Numerical analysis, Mathematical models, Equations, Flow, *Unsteady flow, Bores, Surges, Dam failure, Rupturing, Dry beds, Streambeds, Flood waves, Waves(Water), Beaches.
Identifiers: Breaking waves, Explicit method.

Mathematical models of river and estuary unsteady flow systems, which consists of both gradually varied and rapidly varied unsteady flow equations, were solved in finite difference form. An explicit finite difference scheme with specified rectangular grid intervals based on the method of characteristics was formulated for numerical solution. A technique was developed for tracing bores or surges for which the method of characteristics fails to hold because characteristics cross each other. A simplifying assumption was introduced to overcome the singularity problem that is inherent at the leading tip of a wavefront moving on a dry bed. Several typical computer results were obtained by solving the dam-breaking problem and coastal breaking wave problem. It was demonstrated how the proposed numerical techniques can validly be applied to many practical problems of similar nature. Completion of this computer modeling of unsteady flow systems was believed to be very useful to the future study of dispersion and flushing of pollutant in rivers and homogeneous estuaries. (See also W75-06998) (Humphreys-ISWS)
W75-07024

MATHEMATICAL INVESTIGATION OF A TIDAL RIVER,
Calcutta Port Commissioners (India). Hydraulic Study Dept.
For primary bibliographic entry see Field 2L.
W75-07025

THEORETICAL STUDIES OF LONG WAVE PROPAGATION IN ESTUARIES OF FINITE LENGTH,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-07026

FLOOD ROUTING FOR URBAN RIVER NETWORK,
Osaka Univ. (Japan). Dept. of Civil Engineering.
A. Murota, T. Kanda, and T. Eto.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 339-350, (1973). 7 fig.

Descriptors: *Flood routing, *Model studies, *Mathematical models, *Tidal streams, Simulation analysis, Finite element analysis, Tidal effects, Rivers, Networks, Water levels, Junctions, Open channels, Equations, Analytical techniques, Floods, Water level fluctuations, Tides, Stochastic processes, Unsteady flow, Tributaries, River systems.
Identifiers: One-dimensional flow.

A finite-difference scheme for computer simulations of flood routing for an urban river network and the probabilistic evaluations of high water levels along river channels were developed. A proposed scheme, called the Modified One-Step Lax-Wendroff Scheme, included the finite-difference equations governing junctions and lateral inflow points, and the mutual interaction of flood flow and tidal oscillation for flood routing in tidal rivers. The probabilistic evaluation of high water levels was based on multivariate analysis of observed heavy rainfalls or flood discharges resulting from these rainfalls. Computed water levels including tidal effects were shown to be in complete agreement with field observations. The proposed simulation method should be useful for computer simulations of flood routing in complicated river systems such as urban river networks. (See also W75-06998) (Humphreys-ISWS)
W75-07027

THE PASSAGE OF A FLOOD WAVE THROUGH A JUNCTION,
Sri Lanka Univ., Peradeniya. Dept. of Civil Engineering.
K. Sanmuganathan.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 351-360, (1973). 3 fig, 6 ref.

Descriptors: *Flood waves, *Theoretical analysis, *Rivers, *Junctions, Mathematical studies, Equations, Continuity equation, Mannings equation, Chezy equation, Tributaries, Flood profiles.

The attenuation of a flood wave passing through a junction of a large river with a tributary of comparable size was analyzed. The incoming flood wave was approximated by a number of step waves satisfying the kinematic wave condition, and the disturbances caused in the tributary were approximated to dynamic waves where the dynamic effects were large in comparison with frictional and gravitational effects. A theory based on this model was presented and explicit expressions for the depths and discharges in the different branches were obtained. (See also W75-06998) (Humphreys-ISWS)
W75-07028

SUBMERGENCE COMPUTATIONS UPSTREAM OF CHANNEL OBSTRUCTIONS,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W75-07029

CIRCULATION IN SHALLOW ESTUARIES,
Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-07030

MATHEMATICAL MODELLING OF WATER QUALITY IN A RIVER SYSTEM,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-07031

MATHEMATICAL MODELS FOR THE PLANNING AND MANAGEMENT OF THE SAINT JOHN RIVER SYSTEMS,
Department of the Environment, Ottawa (Ontario). Ecological Systems Research Div.

For primary bibliographic entry see Field 5B.
W75-07032

MATHEMATICAL MODELLING FOR SHORT-TERM TRANSPORT IN VERTICALLY MIXED ESTUARIES,
Madras Univ., Guindy (India). Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 2L.
W75-07033

CHARACTERISTICS OF THE INTERFACIAL REGION OF A TWO-LAYER FLOW SYSTEM,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-07034

A MATHEMATICAL MODEL TO PREDICT DISCHARGE VARIATIONS IN AN ESTUARY WITH SHALLOW WATER AND A LARGE TIDAL RANGE,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).
For primary bibliographic entry see Field 2L.
W75-07035

FINITE ELEMENT NUMERICAL MODELLING OF FLOW AND DISPERSION IN ESTUARIES,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-07036

UNSTEADY FLOW IN OPEN CHANNEL WITH MOVABLE BED,
National Taiwan Univ., Taipei.
C. M. Wu.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 477-488, (1973). 2 fig, 1 tab, 8 ref, 1 append.

Descriptors: *Model studies, *Unsteady flow, *Sediment transport, Open channels, Channel morphology, Beds, Sediments, Streambeds, Flow, Channel flow, Fluid mechanics, Mathematical studies, Theoretical analysis, Mathematics, Equations.
Identifiers: *Movable bed.

A mathematical model for simulating the joint mechanism of unsteady sediment and water flow was presented. This model is based on a treatment of the basic set of partial differential equations for one-dimensional, unsteady, movable bed open-channel flow with homogeneous density. The method of characteristics transforms the basic set of partial differential equations into a set of ordinary differential equations with three different sets of slope. These three new equations are subsequently treated as finite difference equations, and solutions of the unsteady problem are readily possible with the aid of the known boundary or previous conditions. (See also W75-06998) (Sims-ISWS)
W75-07037

GENERAL REPORTS, DISCUSSIONS, LECTURES, VOLUME 4.
For primary bibliographic entry see Field 2J.
W75-07038

THE INTERACTION OF VELOCITY DISTRIBUTION AND SUSPENDED LOAD IN TURBULENT STREAMS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 2J.
W75-07039

APPLICATION OF PHYSICAL AND MATHEMATICAL MODELS FOR RIVER PROBLEMS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2A.
W75-07040

1973 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,
Oregon State Water Resources Board, Salem.
For primary bibliographic entry see Field 7C.
W75-07150

INFLUENCE OF FLOOD WAVES OF MOUNTAIN RIVERS ON DRIFT DISCHARGE,
A. F. Mandych.
Available from the National Technical Information Service, Springfield, Va 22161 as TT-72-51105, $3.25 in paper copy, $2.25 in microfiche. TT 72-51105, 1974, 6 p, 1 fig, 2 tab, 5 ref. Translated from Meteorologiya i Gidrologiya, Vol 2, p 41-43, 1966.

Descriptors: *Rivers, *Flood waves, *Erosion, *Turbidity, Surges, River flow, Runoff, Fluvial sediments, Sediment discharge, Sediments, Flood discharge, Potamology.
Identifiers: USSR.

Violent, fast-moving floods resulting from heavy showers in summer and autumn in mountain rivers Adzhariya and Guriya are very close in hydraulic properties to positive forward-traveling displacement waves, the peculiarities of which have been studied with reference to the sudden rush of water into the tail bays of hydroelectric powerplants. A steep head front is inherent to a forward-traveling displacement wave; in the region of this front, the velocities of the current and particularly the bottom velocities attain maximum values. Consequently, the river flow in the zone of wave front has a highly increased washing and transporting ability. The turbidity of water, and consequently the drift discharge, increase appreciably due to the movement of the wave resulting from the inflow of water. (Sims-ISWS)
W75-07164

THE CHARACTER OF CHANNEL MIGRATION ON THE BEATTON RIVER, NORTHEAST BRITISH COLUMBIA, CANADA,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W75-07191

FLASH FLOOD POTENTIAL FROM CHANNEL MEASUREMENTS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-07203

A METHOD FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN SOUTH DAKOTA,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 4A.
W75-07211

A HYDROLOGIC ASSESSMENT OF THE SEPTEMBER 14, 1974, FLOOD IN ELDORADO CANYON, NEVADA,
Geological Survey, Carson City, Nev.
P. A. Glancy, and L. Harmsen.
Open-file report 75-14, December 1974. 69 p, 26 fig, 5 tab, 9 ref.

Descriptors: *Flash floods, *Thunderstorms, *Nevada, *Disasters, Sediment transport, Erosion, Flood damage, Peak discharge, Flood waves.
Identifiers: *Eldorado Canyon(Nev).

A devastating flash flood of thundershower origin struck Eldorado Canyon, a 22.9 square-mile drainage with a past flooding history, in southern Nevada at about 2:30 p.m., September 14, 1974. The severe runoff resulted from intense basinwide rain and hail at rates up to 3 inches of precipitation per half hour. The storm moved downbasin and generally increased in intensity with time, which compounded runoff rates. Peak discharge was estimated to be 76,000 cfs just upstream from the developed area near the canyon mouth. About 2,000 acre-feet of runoff reached Lake Mohave, the canyon terminus. Runoff dumped an estimated 70,000 cu yd (about 100,000 tons) of inorganic sediment in Lake Mohave and throughout the lowermost canyon reach. It also delivered an estimated 4 acre-feet of organic or floating debris to Lake Mohave. Although the recurrence interval for this magnitude runoff is great, a similar event could occur in any given year. With proper understanding and informed planning, the risk of damage from similar floods in the future can be greatly reduced. (Knapp-USGS)
W75-07214

INDEX OF FLOOD MAPS FOR CALIFORNIA PREPARED BY THE U.S. GEOLOGICAL SURVEY THROUGH 1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-07216

FLOODS OF SEPTEMBER-OCTOBER 1967 IN SOUTH TEXAS AND NORTHEASTERN MEXICO,
Geological Survey, Reston, Va.
E. E. Schroeder, R. U. Grozier, D. C. Hahl, and A. E. Hulme.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, for $3.55. (paper cover) Water-Supply Paper 1880-B, 1974. 52 fig, 3 plate, 17 tab, 8 ref.

Descriptors: *Floods, *Hurricanes, *Texas, *Mexico, Groundwater, Storm runoff, Water levels, Rainfall, Flood data, Hydrological data, Floodwater, Historic floods, Streamflow.

Floods produced by Hurricane Beulah during September and October 1967 in Texas and Mexico were outstanding because of the magnitude of the stage and discharge and because of the number of river basins affected. Previously known maximum stages were exceeded, at the downstream station, in five river basins in Texas by amounts ranging from 2.7 feet at Guadelupe River near Tivoli to 9.2 feet at Aransas River near Skidmore. The greatest relative maximum discharge recorded during the storm occurred at Medio Creek near Beeville, where the peak discharge was 4.1 times the previous maximum since 1919 and 6.0 times the magnitude of a regional 50-year flood. Because of the large volume of fresh-water inflow to bays and estuaries along the Texas coast, the salinity of the water was greatly reduced. Hurricane Beulah caused significant rises in water levels in shallow wells by percolation of rainfall and ponded waters and by the cascading of floodwaters directly into numerous inundated wells. Flooding along the Rio Grande and its floodways below Falcon Dam was the greatest since the American floodway system was completed in 1926. Flooding along the Mexican floodways destroyed all stream-gaging equipment. A 4,000-square-mile area of south Texas having no defined drainage system contains thousands of shallow wind-formed depressions. These normally dry depressions were inundated by the storm runoff, which produced a vast amount of ponded water. Rainfall measurements of 25 inches during the period September 19-25, 1967, were common in Texas, and as much as 35 inches was measured in Mexico. (Knapp-USGS)

W75-07219

SURFACE WATER FEATURES OF FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-07221

INDEX OF SURFACE WATER STATIONS IN TEXAS, OCTOBER 1974.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-07224

PHYSIOGRAPHIC MAP OF THE OKALOACOOCHEE SLOUGH IN COLLIER COUNTY, FLORIDA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 7C.
W75-07225

FLOOD MAPPING IN CHARLOTTE AND MECKLENBURG COUNTY, NORTH CAROLINA,
Geological Survey, Charlotte, N.C.
For primary bibliographic entry see Field 4A.
W75-07230

WATER RESOURCES INVESTIGATIONS IN FLORIDA, 1974.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07231

STREAMFLOW CHARACTERISTICS IN NORTHEASTERN UTAH AND ADJACENT AREAS,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 7C.
W75-07232

HYDROLOGIC UNIT MAP--1974, STATE OF WEST VIRGINIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07234

HYDROLOGIC UNIT MAP--1974, STATE OF INDIANA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07235

HYDROLOGIC UNIT MAP--1974, STATE OF PENNSYLVANIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07236

HYDROLOGIC UNIT MAP--1974, STATE OF OHIO.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07237

MAP SHOWING DRAINAGE AREAS, MIDDLETOWN QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-07239

FRICTIONAL EFFECTS IN SIDE CHANNEL SPILLWAYS WITH INCREASING DISCHARGE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 8B.
W75-07274

2F. Groundwater

A SURROGATE-PARAMETER APPROACH TO MODELING GROUNDWATER BASINS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. W. Labadie.
Water Resources Bulletin, Vol 11, No 1, p 97-114, February 1975. 5 fig, 13 ref.

Descriptors: *Groundwater basins, *Management, *Simulation analysis, *Methodology, *Model studies, Water demand, Evaluation, Optimization, Pumping, Wells, Constraints, Storage, Equations, Systems analysis, *Hydrogeology.
Identifiers: Parameter identification, Surrogate-parameter approach, Least squares error criterion, Problem decomposition, Finite difference models, Duality theory, Gradient method, Transmissibility.

A surrogate-parameter approach to modeling groundwater basins can be efficiently utilized for systematic evaluation of management alternatives. How such a model can be calibrated or identified using optimization techniques is illustrated. A least-squares error criterion is used in formulating the mathematical programming problem for parameter identification; since the problem is large-scale and nonconvex, it is subsequently decomposed via duality theory into several smaller subproblems. A hypothetical problem involving four interacting wells is solved, where transmissibility coefficients are assumed known and storage coefficients determined through solution of the resulting dual problem. A second-order gradient method is used for the nonconvex subproblems so that globality of subproblem solutions during intermediate iterations of the dual problems cannot be guaranteed. In spite of this, results show that convergence to a saddle-point is rapid. The surrogate-parameter approach has the following advantages over current simulation approaches to groundwater basin modeling: (1) conduciveness to modeling nonhomogeneous and nonisotropic basins; (2) less arbitrariness; (3) model amenability to systematic calibration or identification through the use of optimization techniques; and (4) compatibility with systematic algorithms for analyzing a wide range of management strategies. (Bell-Cornell)
W75-06960

EFFECT OF MINING OPERATIONS ON GROUNDWATER LEVELS IN THE NEW LEAD BELT MISSOURI,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 4B.
W75-06986

SEDIMENTOLOGY OF AQUIFERS OF THE TONGUE RIVER FORMATION, NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W75-06993

GROUNDWATER OF SOUTHEASTERN VIRGINIA.
Virginia State Water Control Board, Richmond. Bureau of Water Control Management.
For primary bibliographic entry see Field 4B.
W75-07044

GEOTHERMAL DRILLING IN KLAMATH FALLS, OREGON,
Storey (E. E.) Well Drilling, Klamath Falls, Oreg.
For primary bibliographic entry see Field 8B.
W75-07146

OPTIMUM DEVELOPMENT OF GROUND WATER FROM THE COASTAL AQUIFERS OF DELAWARE; WHERE, HOW MUCH, AND FOR HOW LONG CAN WE SAFELY PUMP OUR COASTAL AQUIFERS,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 4B.
W75-07149

MAJOR AND HISTORICAL SPRINGS OF TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 4B.
W75-07152

RATE OF SULFURIC-ACID PRODUCTION IN YELLOWSTONE NATIONAL PARK,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 2K.
W75-07189

ERTS IMAGERY FOR GROUND-WATER INVESTIGATIONS,
Geological Survey, Bay Saint Louis, Miss. Gulf Coast Hydroscience Center.
For primary bibliographic entry see Field 7B.
W75-07208

SIMULATED DRAWDOWN FOR SELECTED WELL FIELDS IN THE OHIO RIVER ALLUVIAL AQUIFER,
Geological Survey, Louisville, Ky.
For primary bibliographic entry see Field 4B.
W75-07209

HYDROLOGIC- AND SALT-BALANCE INVESTIGATIONS UTILIZING DIGITAL MODELS, LOWER SAN LUIS REY RIVER AREA, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-07212

GROUND-WATER DATA, 1973, INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W75-07215

QUALITY OF THE GROUND WATER IN BASALT OF THE COLUMBIA RIVER GROUP, WASHINGTON, OREGON, AND IDAHO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W75-07217

GROUND-WATER WITHDRAWALS IN THE UPPER PEACE AND UPPER ALAFIA RIVER BASINS, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-07222

ANNUAL REPORT ON GROUND WATER IN ARIZONA--WITH EMPHASIS ON GILA BEND BASIN, MCMULLEN VALLEY, AND THE SOUTHEAST PART OF THE HARQUAHALA PLAINS--SPRING 1973 TO SPRING 1974.
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W75-07223

HYDROLOGY AND GEOLOGY OF DEEP SANDSTONE AQUIFERS OF PENNSYLVANIAN AGE IN PART OF THE WESTERN COAL FIELD REGION, KENTUCKY,
Geological Survey, Louisville, Ky.
R. W. Davis, R. O. Plebuch, and H. M. Whitman.

Kentucky Geological Survey, University of Kentucky, Lexington, Series 10, Report of Investigations 15, 1974. 26 p, 9 fig, 11 plate, 1 tab, 17 ref.

Descriptors: *Hydrogeology, *Kentucky, *Water yield, *Aquifer characteristics, Mathematical models, Recharge, Sandstones, Coal mines, Mining, Water resources, Borehole geophysics.
Identifiers: Western Coal Field region(Ky).

Sandstone aquifers of Early Pennsylvanian age in the Western Coal Field region of Kentucky yield fresh water from wells as deep as 1,000 feet. The aquifer sands were deposited within valleys cut on the Late Mississippian surface and as deltaic and barrier-bar deposits that overlie both the Mississippian and earlier Pennsylvanian valley-filling deposits. Most of the aquifers have low transmissivity and storage properties, no perciptible recharge from the surface, and steadily declining water levels in the vicinity of centers of pumping. These characteristics were confirmed by a digital computer model. One aquifer which is not presently developed may have a potential yield as much as 300 gpm to individual wells and probably can receive recharge from the surface. Because of their poor hydrologic characteristics, the deep Pennsylvanian aquifers do not seem capable of supplying water for any large-scale economic development of the region. (Knapp-USGS)
W75-07228

HYDROLOGY OF THE SAND-AND-GRAVEL AQUIFER IN CENTRAL AND SOUTHERN ESCAMBIA COUNTY, FLORIDA, PRELIMINARY REPORT--NOVEMBER 1973,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W75-07229

WATER RESOURCES INVESTIGATIONS IN FLORIDA, 1974.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07231

MAP SHOWING DEPTH TO WATER, ANCHORAGE AREA, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W75-07238

CONTOUR MAP OF THE BEDROCK SURFACE, MOUNT HOLYOKE QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-07240

DELINEATION OF BURIED GLACIAL-DRIFT AQUIFERS,
Geological Survey, Denver, Colo.
T. C. Winter.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, $3.15 single copy. Journal of Research of the US Geological Survey, Vol 3, No 2, p 137-148, March-April 1975. 12 fig, 1 tab, 21 ref.

Descriptors: *Glacial aquifers, *Stratigraphy, *Aquifers, *Mapping, *Statistical methods, Hydrogeology, Glacial drift, Glacial sediments.

Locating and delineating buried glacial-drift aquifers poses one of the major problems to hydrogeologists working in glacial terrain. To show the vertical and horizontal boundaries of aquifers, most techniques require a multiple set of maps, a fence diagram, or a combination of maps and sections. Calculations of the first two moments (mean and standard deviation) of a discontinuous distribution result in values that represent the center of gravity (mean position) and spread (standard deviation) of all the sand units in a drill hole. Data for the moment method consist of depth to center point and thickness of each sand unit. A 2,600 sq mi area in northwestern Minnesota that contained 71 test holes drilled to bedrock was used to test the usefulness of the moment method in glacial terrain. Plots of relative position of center of gravity and relative spread showed three groupings for relative center of gravity (shallow, 0-26 percent, medium, 30-55, and deep 58-72) and three for spread of sand units (narrow, 1-5 percent, medium, 8-19, and wide, 22-38). The resulting vertical-variability pattern map shows the areas of each of the nine combinations of these two factors. Because the vertical-variability map does not show quantity of sand, the map is most informative if the total thickness of sand, or percent sand of total drift thickness, is recorded by each hole location on the map. The center or gravity is useful for describing the vertical position of the principal sand in a drill hole because it lies within the principal sand unit in 34 of the 63 holes that contained sand, and it is within 15 percent (based on total drift thickness) of the principal sand unit in 22 of the remaining 29 holes. (Knapp-USGS)
W75-07242

GEOLOGIC SETTING AND CHEMICAL CHARACTERISTICS OF HOT SPRINGS IN WEST-CENTRAL ALASKA,
Geological Survey, Anchorage, Alaska.
T. P. Miller, I. Barnes, and W. W. Patton, Jr.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, $3.15 single copy. Journal of Research of the US Geological Survey, Vol 3, No 2, p 149-162, March-April 1975. 1 fig, 5 tab, 60 ref.

Descriptors: *Hot springs, *Geothermal studies, *Alaska, *Geochemistry, Thermal water, Mineral water, Water temperature, Water chemistry, Hydrogeology.

Numerous hot springs occur in a variety of geologic provinces in west-central Alaska. Granitic plutons are common to all the provinces, and the hot springs are spatially associated with the contacts of these plutons. Of 23 hot springs whose bedrock geology is known, all are within 4.8 km of a granitic pluton. The occurrence of hot springs, however, appears to be independent of the age, composition, or magmatic history of the pluton. Most of the analyzed hot springs appear to have chemical and isotopic compositions indicating that they were derived from deeply circulating meteoric water. About 25 percent of the analyzed hot springs show a distinct saline character with high concentrations of chloride, sodium, potassium, and calcium indicating either much more complex water-rock reactions that in the other hot springs or the addition of another type of water. Chemical geothermometers suggest subsurface temperatures in the general range of 70 deg to 160 deg C. If the hot spring waters have derived their heat solely from deep circulation, they must have reached depths of 2 to 5 km, assuming geothermal gradients of 30 deg to 50 deg C/km. If a shallow igneous heat source exists in the area or if dilution or mixing has occurred, these depths may be shallower. The geologic and chemical data, although preliminary, suggest that most of the hot springs of west-central Alaska have relatively low subsurface temperatures and limited reservoir capacities in comparison with geothermal areas presently being utilized for electrical power generation. The springs may, however, have some potential for limited power generation locally, if and when heat-exchange technology becomes available, as well as for space heating and agricultural uses. (Knapp-USGS)
W75-07243

THE USE OF THE DIGITAL SIMULATION LANGUAGE PDEL IN HYDROLOGIC STUDIES,
Wayne State Univ., Detroit, Mich. Dept. of Mathematics.
W. C. Tam, and W. J. Karplus.
Water Resources Bulletin, Vol 9, No 6, p 1100-1111, December 1973. 6 fig, 5 ref. OWRR B-150-CAL(12). NSF Grant GK31463X.

Descriptors: *Simulation analysis, *Computer programs, *Numerical analysis, *Groundwater movement, *Groundwater recharge, Aquifers, Dupuit-Forchheimer theory, Percolation, Analytical techniques, Equations, Hydrologic systems, Digital computers, Programming languages.
Identifiers: *Partial differential equations, PDEL computer program, Parabolic equations.

Digital simulation languages have become popular means for the simulation and analysis of systems on a digital computer. However, the use of these languages for the simulation of systems characterized by partial differential equations has been very limited. In hydrologic studies, mathematical models involving elliptic and parabolic partial differential equations are most common. The application of the digital simulation language PDEL to analyze problems in hydrologic studies was described. PDEL is designed specifically to solve partial differential equations of the elliptic, parabolic, and hyperbolic types. The language provides convenient and easy-to-learn statements for the description of problem to the computer. A computer program is automatically generated to solve the problem and the numerical solution printed and plotted. Two important hydrologic problems were used for illustration. The first was the analysis of groundwater table recession in large unconfined aquifers and the second was the growth of groundwater mounds in response to uniform percolation. (Singh-ISWS)
W75-07254

REPORT ON WATER SUPPLY, FORT HUACHUCA AND VICINITY, ARIZONA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4B.
W75-07332

A RELATION BETWEEN GAMMA RADIATION AND PERMEABILITY, DENVER-JULESBERG BASIN,
Shell Oil Co., Denver, Colo.
For primary bibliographic entry see Field 4B.
W75-07335

2G. Water In Soils

CONTRIBUTIONS TO THE KNOWLEDGE OF BROWN ALLUVIAL SOILS IN THE LOWER FLOODPLAIN OF THE JIU RIVER,
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
I. Nitu, A. Ghita, and E. Ursuleac.
An Inst Stud Cercet Pedol, 39, p 295-311, 1971, Illus, English summary.

Descriptors: Europe, Soils, *Brown soils, *Flood plains, Alluvium, Soil(Physical properties), Soil(Chemical properties), *Soil analysis, Soil classification.
Identifiers: *Romania(Jiu River).

A characterization of natural conditions determining the development of brown alluvial soil in the lower flood-plain of the Jiu river (Romania) is presented. An important role in the development of these soils is displayed by the relief which, escaping the influence of flood, favors the continuity of the pedogenetic process. From the analysis of morphologic features and physico-chemical data an evident difference between brown alluvial soils and other alluvial soils was revealed. The

evolution of these soils towards the zonal ones is indicated by certain features as: depth of soils existence of certain horizons well defined by their color and structure, carbonate leaching, as well as humus distribution along the soil profile.--Copyright 1974, Biological Abstracts, Inc.
W75-06982

BACTERIAL METHANE OXIDATION AND ITS INFLUENCE IN THE AQUATIC ENVIRONMENT,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W75-06987

EARTH MANUAL, A WATER RESOURCES TECHNICAL PUBLICATION.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W75-07046

CHEMICAL ANALYSIS FOR EVALUATION OF SOIL SORPTION PROPERTIES,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5B.
W75-07058

THE DEPENDENCE OF BARE SOIL ALBEDO ON SOIL WATER CONTENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, R. D. Jackson, R. J. Reginato, B. A. Kimball, and F. S. Nakayama.
Journal of Applied Meteorology, Vol 14, No 1, p 109-113, February 1975. 7 fig, 10 ref.

Descriptors: *Albedo, *Remote sensing, *Solar radiation, *Infrared radiation, *Soil moisture, Loam, Soil moisture meters, Gravity, Drainage, Air-earth interfaces, Soil water movement, Measurement, Evaporation.
Identifiers: *Microwave radiometers, *Zenith angle.

Simple albedo measurement may prove useful for sensing surface soil water content and as a research tool in the study of evaporation of water from soil. Intensive concurrent measurements of the albedo and soil water content of a drying bare soil indicated that albedo, normalized for sun zenith angle effects, is a linear function of the soil water content of a very thin surface layer (less than 0.2 cm thick) over a sizeable vilumetric water content range (0.00 to 0.18 for an Avondale loam). Albedo is also well correlated with the average soil water content of greater soil thicknesses. Measurements to a depth of 10 cm indicated that the relation is relatively independent of season. (Schicht-ISWS)
W75-07062

INFLUENCE OF SAMPLE DISTURBANCE AND TEST METHOD ON KEY ENGINEERING PROPERTIES OF MARINE SOILS,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering.
M. Perlow, Jr.
Master's Thesis, June 1974. 65 p, 11 fig, 1 tab, 46 ref, 2 append. SG-NG-2-72, NSF-GA-37079, ONR N00014-67-A-370-005.

Descriptors: *Bulk density, *Environmental effects, Shear strength, Sediments, Gulf of Mexico, Bottom sediments, Ocean environments, Coasts, Engineering, Sampling, *Soils, *Testing.
Identifiers: *Vane shear strength, *Environmental impact, San Diego Trough, Wilkinson Basin, Abyssal Plain, Mississippi Delta, Marine soils, Gulf of Maine, Sediment properties.

Detailed measurements of bulk density and vane shear strength were made in situ and on gravity cores in the San Diego Trough, Wilkinson Basin, and Abyssal Plain and Mississippi Delta areas of the Gulf of Mexico. Comparisons of in situ and laboratory measurements were made to evaluate the influence of sample disturbance and test method on bulk density and vane shear strength. Location differences between in situ and gravity core locations and the associated areal variation of bulk density and vane shear strength were described in detail for all comparisons. The influence of sample disturbance on vane strength was difficult to evaluate because of differences in vane rotation rate and vane size between in situ and laboratory vane measurements. Large strength differences resulted from the great differences in angular shear velocity at the vane blade edges between in situ and laboratory vane measurements. A direct linear relationship between vane strength and angular shear velocity was found to exist in the Wilkinson Basin and San Diego Trough Test Areas. Comparison of in situ and laboratory vane strengths at a standar shear velocity, rather than a standard rotation rate, is proposed to eliminate uncertainties associated with rotation rate and vane size differences. A vane test procedure for both in situ and laboratory vane tests based on angular shear velocity is outlined. (NOAA)
W75-07074

MASS PHYSICAL PROPERTIES, SLIDING AND ERODIBILITY OF EXPERIMENTALLY DEPOSITED AND DIFFERENTLY CONSOLIDATED CLAYEY MUDS,
Tuebingen Univ. (West Germany). Geologisch-Palaontologisches Institut.
For primary bibliographic entry see Field 2J.
W75-07266

2H. Lakes

THE HELME-RESERVOIR NEAR KELBRA (KYFFHAEUSER, DDR): III. THE PLANKTON DURING 1967-1970 (IN GERMAN),
Martin Luther-Universitaet, Halle-Wittenberg (East Germany). Hygiene Institut.
Hermann Heynig.
Arch Protistenkd. Vol 114, No 1/2, p 14-33, 1972, Illus, English summary.

Descriptors: *Reservoirs, *Plankton, Europe, *Water quality.
Identifiers: *East Germany(Kelbra).

Some information about the reservoir near Kelbra (district of Halle) (East Germany) is given. Some aspects of the water quality and some general data about the plankton are given. The list of all organisms found in the plankton from 1967-1970 is followed by taxonomical and ecological observations on some interesting plankton organisms.--Copyright 1973, Biological Abstracts, Inc.
W75-06937

ON THE EFFICIENT ALLOCATION OF ENVIRONMENTAL ASSIMILATIVE CAPACITY: THE CASE OF THERMAL EMISSIONS TO A LARGE BODY OF WATER,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5B.
W75-06950

WATER MANAGEMENT--A GENERAL REPORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W75-06953

TYPES OF EROSION AND DEPOSITION OF SEDIMENTS IN LAKE ASHTABULA AND THE CONTROLLING PROCESSES,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-06996

RECOVERY OF THE MUD SUBSTRATE AND ITS ASSOCIATED FAUNA FOLLOWING A DRY PHASE IN A TROPICAL LAKE,
Newcastle-upon-Type Univ. (England). Dept. of Zoology.
A. J. McLachlan.
Limnol Oceanogr. Vol 19, No 1, p 74-83. 1974, Illus.

Descriptors: Precipitation(Atmospheric), *Excessive precipitation, Rain, *Tropical regions, *Benthos, *Benthic fauna, Insects, Aquatic populations, Populations, Environmental effects, *Mud, Lakes, Erosion, Lakes.
Identifiers: Chironomus-transvaalensis, Lake Chilwa.

Lake Chilwa was dry for over a year. Following heavy rains, refilling was complete within 5 mo. and, after 6 wk, benthic insect populations of up to 3500 mg m-2 were recorded. This pioneer population, mainly larvae of Chironomus transvaalensis disappeared 12 wk later leaving a scanty benthic fauna resembling that of the drying phase. Isolated populations of C. transvaalensis persisted in some peripheral sites. The disappearance of fauna followed precipitation of fine grained material derived from erosion at the advancing shoreline during filling, which lowered the resistance of the larvae to major salinity variations and subsequent seasonal events. Persistence of larvae at the periphery was associated with plant debris which seemed to counteract the effects of the change in the mud.--Copyright 1974, Biological Abstracts, Inc.
W75-07066

DISPERSION OF FLOATABLES IN LAKE CURRENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
C. R. Murthy.
Journal of Physical Oceanography, Vol 5, No 1, p 193-195, January 1975. 2 fig, 9 ref.

Descriptors: *Lakes, *Water circulation, *Mixing, Hydraulics, Stratification, Meromixis, Mixolimnion, Epilimnion, Thermal stratification, Thermocline, *Lake Ontario, Currents(Water), *Dispersion, On-site investigations, *Canada, *Path of pollutants.
Identifiers: *Subsurface lake currents, Floatables.

A group of ten sub-surface drogues was released in a cluster in the epilimnion 15 km offshore near Oshawa, Lake Ontario, and the subsequent drift and horizontal spread were followed for 72 hours by using the radar/decca navigation system of the Canadian Survey Ship, Limnos. Experimental data suggested periodic shrinking and expansion of the drogue group at approximately 16-18 hours, corresponding to the local inertial period. This was attributed to the generation of convergence and divergence flow fields as the inertial currents are modified by the sloping shore line or a sloping thermocline. Mesoscale motions such as convergence and divergence of the flow field as well as turbulent dispersion due to random eddies were shown to be important considerations in the kinematics of floatables. (Jess-ISWS)
W75-07068

SPATIAL AND TEMPORAL VARIATIONS OF THE TURBULENT FLUXES OF HEAT, MO-

MENTUM, AND WATER VAPOR OVER LAKE ONTARIO DURING IFYGL,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 2D.
W75-07080

WATER DEVELOPMENT OF THE NORTH DAKOTA POTHOLE REGION FOR FISH PRODUCTION,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. J. Peterka.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 471, $3.25 in paper copy, $2.25 in microfiche. Research Report No. WI-221-022-74, November, 1974. 6 p, 3 ref. OWRT A-032-NDAK(2).

Descriptors: *Ecology, *Fish, *Wetlands, *Rainbow trout, Benthos, Invertebrates, Plankton, Salamanders, Wildlife, Water chemistry, Ducks, Population, Feeding habits, Estimating, *North Dakota.

To determine the feasibility of growing rainbow trout commercially in south central North Dalota, three prairie pothole lakes were stocked with 500 trout per ha. Mortality in all lakes was high from May to June, ranging from 23 to 85 percent. Two lakes summerkilled in August when decay of Aphanizomenon caused dissolved oxygen levels to drop below 1.0 mg/l. On the two lakes that did not summerkill, only 4.4 percent of the 1971 stock and 0.1 percent in 1972 was harvested in October in the 24 ha lake; 0.8 percent was harvested in the 4 ha lake in 1971. Dissolved oxygen lows in these lakes were 2.4 mg/l (4 ha lake) and 4.5 mg/l (24 ha lake), respectively; maximum phytoplankton blooms were 19 mm3/l and 7 mm 3/l. Maximum surface temperature for all lakes was 25 C; alkalinity ranged from 226 to 552 mg/l as CaCO3; soluble phosphates from 0.27 to 3.02 mg/l; nitrate-nitrite nitrogen from 0.00 to 0.79 mg/l; total hardness from 452 to 1,084 mg/l as CaCO3; specific conductance from 1,220 to 2,800 micromhos cm-3 at 25 C; and pH from 7.7 to 9.7. Amphipods, Chaoborus and chironomids comprised 29.8, 29.7 and 15.1 percent by volume of total food consumed by trout from June to October. Populations of tiger salamanders (Ambystoma tigrinum) ranged from 150/ha to 1,030/ha in the four lakes. Trout can reach a commercially useful size in one season; however, without special management, it is not feasible to grow them in the prairie pothole lakes studied.
W75-07103

CAN THE BALTIC SEA BE TURNED INTO A FRESHWATER LAKE,
For primary bibliographic entry see Field 4A.
W75-07165

SEASONAL NITRATE CYCLING AS EVIDENCE FOR COMPLETE VERTICAL MIXING IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W75-07198

CHEMICAL AND BIOLOGICAL QUALITY OF LAKE DICIE AT AUSTIS, FLORIDA, WITH EMPHASIS ON THE EFFECTS OF STORM RUNOFF,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5C.
W75-07213

HYDROLOGY OF THE OKLAWAHA LAKES AREA OF FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-07220

PHYSIOGRAPHIC MAP OF THE OKALOACOOCHEE SLOUGH IN COLLIER COUNTY, FLORIDA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 7C.
W75-07225

ANOTHER EXPLANATION OF THE OBSERVED CYCLONIC CIRCULATION OF LARGE LAKES,
Massachusetts Inst. of Tech., Cambridge.
J. R. Bennett.
Limnology and Oceanography, Vol 20, No 1, p 108-110, January 1975. 3 fig, 6 ref.

Descriptors: *Water circulation, *Lakes, *Upwelling, *Winds, Bodies of water, Surface waters, Advection, Circulation, Thermal stratification, Stratified flow, Limnology, Drag, Stress, Currents(Water).
Identifiers: *Cyclonic circulation, Lake circulation theory, Lake static stability, Lake surface stress.

Two classical explanations of the lake surface circulation are well known. First, Emery and Csanady explain that as warm surface water is advected to the right of the prevailing wind, increased wind drag over this warm water results in a cyclonic wind stress that drives a cyclonic surface flow. Wunsch explains that cyclonic flow as the Lagrange drift induced by internal Kelvin waves. A third mechanism was shown to be as important as the two classical ones. This mechanism was explained by the variation of lake static stability caused by wind induced upwelling. (Lee-ISWS)
W75-07246

NEARSHORE LAKE CURRENTS MEASURED DURING UPWELLING AND DOWNWELLING OF THE THERMOCLINE IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
J. O. Blanton.
Journal of Physical Oceanography, Vol 5, No 1, p 111-124, January 1975. 8 fig, 3 tab, 14 ref.

Descriptors: *Currents(Water), *Lake Ontario, *Thermocline, Lake basins, Upwelling, Cycles, Shores, Winds, Great Lakes, Measurement, Bottom sediments, Temperature, Time series analysis, Coasts, Kinetics, Energy.
Identifiers: *Downwelling, Kelvin wave, Bottom profiles.

The upwelling-downwelling cycles observed along the north shore of Lake Ontario had periods of about 12 to 16 days in length. Currents associated with the downwelling cycle were typically stronger. The periods of the cycles were at least a factor of 2 larger than were periods expected from cyclone movements across the Great Lakes. Although the upwelling-downwelling cycles are generally a response to the wind, this discrepancy suggested a tendency for a more wave-like periodic response. The kinetic energy in currents near the theoretical inertial period clearly delineated a nearshore zone of about 8 km in width. Internal wave periods observed were 14 and 17 h, but no 14 h periods were observed beyond 8 km. Most of the upwelling and downwelling was confined to this zone. The sloping shore model of Csanady (1971a) gave a width near 6 km measured from the point where the equilibrium thermocline intersected the bottom. This point was located at depths between 10 and 20 m from July to October, or roughly about 1 to 3 km from shore, yielding a total theoretical width of about 7 to 9 km. (Roberts-ISWS)
W75-07251

SHORT-PERIOD VARIATIONS IN A GREAT LAKES COASTAL CURRENT BY AERIAL PHOTOGRAPHY,
Wisconsin Univ., Madison. Marine Studies Center.
L. A. Yeske, and T. Green.
Journal of Physical Oceanography, Vol 5, No 1, p 125-135, January 1975. 19 fig, 1 tab, 28 ref. NSF Grant 33140, NASA, Grant NGL 50-002-127.

Descriptors: Great Lakes, *Current(Water), *Coasts, *Photogrammetry, *Lake Superior, *Aerial photography, Shear, Eddies, On-site data collections, Measurement, Remote sensing.
Identifiers: Keweenaw Current, Draft cards, Countercurrents.

Measurements of the surface velocity structure off the Keweenaw Peninsula of Lake Superior were obtained in 1971 and 1972 with the use of aerial photography to track surface drift cards. Variations in the current structure were described at 9-min intervals, over a 45-min period of one experiment, by streamlines and isotachs extending across the entire coastal region. Speed contour irregularities and eddies of about 100 m diameter could be traced in some of the aerial sequences. Speed fluctuations of 25% of the mean flow occurred frequently. The horizontal divergence and relative vorticity structure for each sequence was also calculated; magnitudes of each were up to three times that of the local Coriolis parameter. Both inshore and offshore countercurrents were observed. The region of anticyclonic shear was typically twice as wide as the cyclonic shear region. Cross-stream velocity gradients were about three times larger than those measured in the Gulf Stream. Rossby numbers ranged from 0.5 to 0.8, and inertial accelerations appeared to be larger than local accelerations at least 25% of the time. Horizontal eddy viscosity coefficients ranged from + or -1000 to + or -100,000 sq cm/s. Geostrophic calculations based on bathythermograph sections, airborne radiometer flights, and meteorological data were also discussed. (Roberts-ISWS)
W75-07252

MICROBIAL TRANSFORMATIONS OF MERCURY IN AQUATIC ENVIRONMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-07275

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 1, SCOPE OF STUDY AND REVIEW OF AVAILABLE DATA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. G. Outlaw, and D. L. Durham.
Available from the National Technical Information Service, Springfield, Va., 22161, as Ad-783 463, $4.25 in paper copy, $2.25 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report H-74-6, Report 1, July 1974. 69 p, 7 tab, 48 ref.

Descriptors: *Seiches, *Waves(Water), *Airports, *Lake Erie, *Hydraulic models, Model studies, Hydraulics, Feasibility studies, Data collections, Reviews, *Seiches, Tides, Water quality, Refraction(Water waves), Lakes.
Identifiers: *Mass circulation(Lakes), Wave diffraction(Lakes).

The scope of the U.S. Army Engineer Waterways Experiment Station's (WES) investigation of the proposed Lake Erie International Jetport is described and data obtained from the literature and private individuals are summarized. The objectives of the investigation, Part I, include a review of the literature concerning wave activity (wind waves, seiches, and tides) and mass circulation in Lake Erie, preliminary design of necessary hydraulic models, and preliminary application of

analytical and/or numerical models to seiching and mass circulation. The investigation is separated into five tasks: (a) review of the literature, (b) seiche analysis, (c) wave refraction and diffraction analyses, (d) mass circulation analysis, and (e) preliminary model design. Existing lake geology, climate, bottom and shoreline characteristics, water balance, water temperature, lake levels, lake currents, wave regime, shore erosion, and water quality data in the central basin of Lake Erie near Cleveland, Ohio, are summarized in Part II. (WES)
W75-07286

EXTREME FLUCTUATIONS IN WATER QUALITY OF EUTROPHIC FISH KILL LAKES: EFFECT OF SEDIMENT MIXING,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W75-07290

PERIPHYTON COLONIZATION AND PRODUCTIVITY IN THE REACTOR COOLING RESERVOIR--PAR POND,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 5C.
W75-07292

AMCHITKA BIOENVIRONMENTAL PROGRAM. LIMNOLOGY OF AMCHITKA ISLAND, ALASKA,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5A.
W75-07293

NUTRIENTS IN ICE. SOME DATA FROM A HIGH MOUNTAIN LAKE,
For primary bibliographic entry see Field 5C.
W75-07301

DIEL PERIODICITY IN THE PHYTOPLANKTON COMMUNITY OF THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND. I. PHYTOPLANKTONIC PRIMARY PRODUCTION AND RELATED FACTORS,
Helsinki Univ. (Finland). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-07302

GAMMARUS PREDATION AND THE POSSIBLE EFFECTS OF GAMMARUS AND CHAOBORUS FEEDING ON THE ZOOPLANKTON COMPOSITION IN SOME SMALL LAKES AND PONDS IN WESTERN CANADA,
Calgary Univ. (Alberta). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-07309

CRUSTACEAN PLANKTON COMMUNITIES OF 340 LAKES AND PONDS IN AND NEAR THE NATIONAL PARKS OF THE CANADIAN ROCKY MOUNTAINS,
Calgary Univ., Alberta. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-07310

PHOSPHORUS DYNAMICS IN PONDS,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 5C.
W75-07316

LAKE TUUSULA DESTRATIFICATION AND AERATION TEST, WINTER 1972/73,
National Water Board of Finland, Helsinki.
For primary bibliographic entry see Field 5C.
W75-07317

WATER QUALITY, NUTRIENTS, AND NET PLANKTON ANALYSIS OF SUMMERSVILLE LAKE,
West Virginia Univ., Morgantown. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-07319

SPATIAL AND SEASONAL VARIATIONS IN PHYTOPLANKTONIC PRIMARY PRODUCTION AND BIOMASS IN THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND,
Helsinki Univ (Finland). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-07323

NATURAL RESOURCES MANAGEMENT IN THE GREAT LAKES BASIN,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6E.
W75-07344

2I. Water In Plants

THE RELATION OF TEMPERATURE AND LEAF WETNESS TO THE DEVELOPMENT OF LEAF BLIGHT OF WHEAT,
Indian Agricultural Research Inst., New Delhi. Div. of Mycology and Plant Pathology.
For primary bibliographic entry see Field 3F.
W75-06943

THE EFFECTS OF HUMIDITY AND CYTOKININ ON GROWTH AND WATER RELATIONS OF SALT-STRESSED BEAN PLANTS,
Ceara Univ., Fortaleza (Brazil). Departmente de Bioquimica y Biologia Molecula.
For primary bibliographic entry see Field 3C.
W75-07022

THE EFFECT OF CONIFERS ON THE CHEMISTRY AND MASS BALANCE OF TWO LARGE LYSIMETERS IN CASTRICUM (THE NETHERLANDS),
Food and Agriculture Organization of the United Nations, Kitale (Kenya). Turkana Irrigation Project.
For primary bibliographic entry see Field 2D.
W75-07052

DESERT BIOLOGY, VOL. 2.
G. W. Brown (ed.) 601 p. Illus. Academic Press, Inc.: New York, N.Y., London, England, 1974, Pr. $45.00.

Descriptors: *Deserts, *Biology, Africa, United States, Soils, Arid regions, Vegetation, Algae, Lichens, Fungi, Arthropods, Fish, *Water requirements, *Desert plants.
Identifiers: *Saudi Arabia, *Sahara Desert, *Sonoran Desert, Pimian Indians.

This volume continues the study begun in the 1st volume on the physical and biological aspects of desert structure. Hydrogeology of deserts, desert soils and physical environment and vegetation of the Sahara desert (North Africa) are examined in the opening chapters. Another article focused on the algae, lichens and fungi found in deserts while others study the arthropods and fishes of arid regions and their adaptations to this type of environment are discussed. Included is a paper on water relations and ecophysiology of desert plants. Man's relationship to the desert is explored in the 2 concluding articles which deal with the Pimian Indians of the Sonoran Desert (USA) and with those living in areas north of Jiddah in Saudi Arabia. Each article contains numerous literature references and illustrations. Systematic, author and subject indexes are included.--Copyright 1974, Biological Abstracts, Inc.
W75-07193

PRODUCTIVITY INCREASE OF AGRICULTURAL ECOSYSTEMS OF DANUBIAN LOWLANDS BY DAMMING AND BY DRAINAGE, (IN FRENCH),
Academia de Stiinte Agricole si Silvice, Bucharest (Rumania).
For primary bibliographic entry see Field 3F.
W75-07279

NUTRITIVE VALUE OF OATS AND SUDAN GRASS GROWN AT CONTROLLED TEMPERATURES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 3F.
W75-07330

2J. Erosion and Sedimentation

EFFECT OF DIVERTING MISSISSIPPI RIVER WATER TO TEXAS ON SEDIMENTATION IN THE RIVER,
Louisiana Water Resources Research Inst., Baton Rouge.
M. Alawady.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 342, $0.00 in paper copy, $2.25 in microfiche. Completion Report, March 1974. 55 p, 2 fig, 9 tab, 9 ref, append. OWRT A-029-LA(1).

Descriptors: *Sedimentation, *Mississippi River, *Louisiana, *Diversion, Discharge(Water), Flow, *Regression analysis, *Mathematical models, Model studies, *Sediment transport, Sediment load, Water transfer, Water importing.

The proposed diversion of water from the lower Mississippi River to Texas and eastern New Mexico will affect the discharge and sedimentation characteristics of the River. An empirical relationship between discharge, depth, and flow velocity was determined by regression analysis in the form of a non-linear mathematical model. By use of this model the daily flow velocity and water depth at Coochie, Tarbert's Landing, Red River above Old River, and Simmesport were obtained and tabulated. An attempt has been made to estimate the parameters of a non-linear system relating the sediment concentration to the velocity, depth, energy slope, and settling velocity at these four stations. Although a mathematical relationship was established it appeared to be impractical. However, it seems certain that a decline in flow discharge results in a decline of sediment concentration. While it is possible to forecast with some certainty the total discharge in the River, it is impossible to predict any other changes that would occur should the discharges of water, sediment sizes, flow velocities, bed, channel and bank resistance be changed.
W75-06983

TYPES OF EROSION AND DEPOSITION OF SEDIMENTS IN LAKE ASHTABULA AND THE CONTROLLING PROCESSES,
North Dakota Univ., Grand Forks. Dept. of Geology.
D. T. Pederson.
Research Report No. WI-221-024-74, November, 1974, 3 p. OWRT A-030-NDak (1).

Descriptors: *North Dakota, *Erosion, Sedimentation, Reservoirs, Lacustrine, Wave action, Density currents, *Sediment deposits, *Lakes, Sediment transport, *Erosion control, Sediment control.
Identifiers: *Lake Ashtabula(NDak).

The sources, transportation, and deposition of sediment were studied in Lake Ashtabula from June, 1969 to June, 1971. Shoreline erosion was found to contribute a third or more of the sediment accumulating in the lake. The Sheyenne River contributes about a third of the sediment accumulating, and other sources such as ephemeral streams and slopewash are believed to make up the remainder. The primary erosional processes along the shorelines of the lake are slumping, undercutting, block separation, organic activity, and frost weathering. The rates of erosion are influenced by the percentage of sand-sized and larger particle sizes in shoreline banks, groundwater regime of shoreline, oreientation of shoreline, use of the shoreline, and the depth of the lake along the shoreline. Sand-sized and larger particles eroded from shoreline banks are moved by wave action to bay areas along the shorelines. Silt and clay particles are transported in suspension by currents whose densities are temperature dependant. These currents pool in the depressions on the lake bottom, resulting in greater sedimentation in the low areas. The accumulating sediment is silt and clay-sized, calcareous, with about 10 percent organic material. The initially deposited sediment is 80 percent water. The reservoir will be completely filled with sediment in 5,000 years based on sedimentation to date. A life of 10,000 years is suggested because of other considerations.
W75-06996

RIVER AND ESTUARY MODEL ANALYSIS, VOLUME 3.
For primary bibliographic entry see Field 2E.
W75-06998

SIMULATION OF SEDIMENT TRANSPORT IN HYDRAULIC MODELS,
Technische Universitaet, Obernach (West Germany). Versuchsanstalt fuer Wasserbau-Oskar von Miller-Institut.
H. Scheuerlein.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 1-10. (1973) 2 fig, 1 tab, 2 ref.

Descriptors: *Sediment transport, *Hydraulic models, *Hydraulic similitude, Sediments, Roughness(Hydraulic), Rivers, Alluvial channels, Hydraulics, Movement, Bed load, Suspended load.

In hydraulic models, the demands for similarity of hydraulic roughness and sediment motion often lead to a distortion of both the model and the sediment. The model laws show that a conflict between the need for simulating hydraulic roughness and sediment motion at the same time can arise in the model. The solution of this problem was described by using two different model sediments (basic sediment and moving sediment) simultanously. The basic sediment, consisting of ordinary sand or gravel, was used to modulate the river topography according to the model scale (or scales) whereby the natural grain structure of the river bottom can be maintained. It was supposed to produce the desired roughness. The moving sediment, consisting of lighter plastic material, permitted the investigation of the sediment motion. It was used only during the model runs where it was added continuously to the flow. Grain size and specific weight of the plastic sediment can be computed from equations presented. This principle was successfully applied in three river models where diversions and junctions and their influence on sediment motion was investigated. (See also W75-06998) (Humphreys-ISWS)
W75-06999

RIVER MODELS WITH A MOVABLE BED,
Queen's Univ. Kingston (Ontario). Dept. of Civil Engineering.
M. S. Yalin.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 11-24. (1973) 3 fig, 5 ref.

Descriptors: *Hydraulic similitude, *Hydraulic models, *Alluvial channels, Theroretical analysis, Equations, Rivers, Velocity, Bottom sediments, River beds, Movement, Shape, Dunes, Ripple marks, Streambeds.
Identifiers: *Movable bed, *Dimensionless variables.

The determination of scales for river models with a movable bed was discussed, with special emphasis on the geometrically similar reproduction of large-scale bed features (dunes). The velocity scales were determined from a generalized friction equation which took into account the energy losses due to both skin friction and the geometry of sand waves (ripples and dunes). Application of the analysis was illustrated with four numerical examples. (See also W75-06998) (Humphreys-ISWS)
W75-07000

SOME NOTES ON HYDRAULIC MODEL TESTS OF RIVER CHANNELS,
Public Works Research Inst., Kashima (Japan). Kashima Hydraulics Lab.
For primary bibliographic entry see Field 2E.
W75-07008

HYDRAULIC PROBLEMS OF THE MEKONG RIVER IN THE QUATRE-BRAS REACH,
Vyzkumny Ustav Vodohospodarsky, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 2E.
W75-07012

THE APPLICATION OF RIVER SYSTEM MECHANICS,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07017

UNSTEADY FLOW IN OPEN CHANNEL WITH MOVABLE BED,
National Taiwan Univ., Taipei.
For primary bibliographic entry see Field 2E.
W75-07037

GENERAL REPORTS, DISCUSSIONS, LECTURES, VOLUME 4.
Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand. 433 p. (1973).

Descriptors: *Conferences, *Sediment transport, *Sediment yield, *Hydraulic models, *Mathematical models, *Floods, *River beds, Sediment control, Deposition(Sediments), Scour, Flood damage, Flood control, Warning systems, Sediment discharge, Streamflow, Bed load, Suspended load, Channels, Estuaries, Watersheds(Basins), Peak discharge, Flood flow, Hydrology.
Identifiers: *River mechanics.

River mechanics was discussed at a symposium held at Bangkok, Thailand in 1973. The nine broad subject areas discussed in Volume 4 were: (1) sediment yield and deposition; (2) sediment control and scour prevention; (3) sediment transportation; (4) river bed form; (5) flow and sediment measurement; (6) hydraulic modeling; (7) flood computation; (8) flood damage, warning, and control; and (9) mathematical modeling. Volume 4 contains the proceedings, general reports, and discussions for the twelve technical sessions and two special lectures. (See W75-07039 and W75-07040) (Humphreys-ISWS)
W75-07038

THE INTERACTION OF VELOCITY DISTRIBUTION AND SUSPENDED LOAD IN TURBULENT STREAMS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
A. T. Ippen.
In: General Reports, Discussions, Lectures, Vol. IV; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 341-369, (1973). 17 fig, 2 tab, 23 ref.

Descriptors: *Sediment transport, *Suspended load, *Analytical techniques, *Reviews, Turbulent flow, Particle size, Sediments, Suspended solids, Equations, Mathematical studies, Model studies, Suspension, Resistance, Hydraulics, Alluvial channels, Velocity, Flow, Movement, Fluid friction, Sediment distribution, Distribution patterns, Dispersion, Mixing.
Identifiers: *Concentration-distribution function, Sediment mixtures.

The material presented was intended to summarize the present state of knowledge in the field of suspended load transport in turbulent streams. This knowledge is limited to the steady and uniform two-dimensional flow over a 'flat' bottom with granular particles suspended in various concentrations. Subjects discussed were: (1) historical perspective of problem; (2) analytical approach to suspended load transport including formulation of basic dispersion relation and derivation of basic concentration-distribution function; (3) experimental modifications of basic equations for effect of sediment on velocity distribution, modification of concentration-distribution, and concentration phenomena near the bottom; (4) evaluation of total transport in suspension for single-size particles and mixtures of sediments; and (5) effect of suspensions on hydraulic resistance. Research of the experimental-analytical type provides important insight and will continue to do so, but engineering problems are in the field and all research must be directed to their solution. The continued exploration of all sedimentation aspects is vital to the development of water resources in all countries. Only further progress and full utilization of research capabilities in the laboratory and the field will give assurance that the necessary use of water resources by man will be planned in harmony with the natural environment. (See also W75-07038) (Humphreys-ISWS)
W75-07039

STATISTICAL PROPERTIES OF WAVE-CURRENT FORCE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering, and North Carolina State Univ., Raleigh. Dept. of Geosciences.
For primary bibliographic entry see Field 2L.
W75-07070

STABILIZATION OF COASTAL DREDGE SPOIL WITH SPARTINA ALTERNIFLORA,
North Carolina State Univ., Raleigh. Dept. of Botany; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W75-07071

SEDIMENT MOVEMENT IN TUBBS INLET, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
For primary bibliographic entry see Field 2L.
W75-07072

A NEW TECHNIQUE FOR BEACH EROSION CONTROL,
North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
T. J. French, J. L. Machemehl, and N. E. Huang.
North Carolina University Sea Grant Reprint No. 52. Reprint from North Carolina State University Center for Marine and Coastal Studies Report No. 74-3, July 1974. 81 p, 10 fig, 2 tab, 6 ref, 3 append.

Descriptors: *Beach erosion, *Shore protection, *Erosion control, Water table, Coasts.
Identifiers: *Filtering system, Beach profiles, Coastal processes, Wave action, Beach accretion.

An experimental study of a new technique for beach erosion control was conducted in a wave channel facility. The primary objective was to determine the effects of a sub-sand filtering system on the stability of a beach profile. The filter system was designed, constructed and placed in the beach section 4 in. to 6 in. below the sand surface. The effects of waves on the beach section (filtered/unfiltered) were evaluated. The sub-sand filtering system was used to control the flow conditions at the sediment boundary. In the off-shore zone, the filters had a stabilizing effect on the overlying material (measurements indicated a substantial difference between filtered and unfiltered profiles). In the breaker zone, the filters had little effect on breaker scour. The sediment eroded from the breaker zone was stored in the foreshore zone. In the fore-shore zone, the filters were a tremendous aid in speeding accretion. The filter system generated rapid and large accretion. The filter system was very effective in building/replacing a fore-shore berm. (NOAA)
W75-07073

THE EFFECT OF SEDIMENT ON RESERVOIR WATER QUALITY,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5C.
W75-07116

OYSTER REEF SEDIMENTATION, BILOXI BAY, MISSISSIPPI,
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W75-07148

INFLUENCE OF FLOOD WAVES OF MOUNTAIN RIVERS ON DRIFT DISCHARGE,
For primary bibliographic entry see Field 2E.
W75-07164

OBSERVATIONS ON HILLSLOPE EROSION IN TOWER KARST TOPOGRAPHY OF BELIZE,
Louisiana State Univ., Baton Rouge. Dept. of Geography.
R. C. McDonald.
Geological Society of America Bulletin, Vol 86, No 2, p 255-256, February 1975. 3 fig.

Descriptors: *Karst, *Geomorphology, *Talus, Sinks, Karst hydrology, Carbonate rocks, Subsurface drainage, Land forming, Runoff, Lakes, Erosion, Dolomite, Springs, Topography.
Identifiers: *Karst towers, *Central America(Belize), Hillslope erosion.

Differential erosion in karst topography of Belize forms closed basins around karst towers. Ephemeral lakes that collect in the basins are active in removing talus and undermining hillslope support by corrosion. Channel incision establishes more rapid drainage of the basins that surround towers, resulting in less active hillslope erosion. Tower karst topography of coastal Belize is in the process of changing from a landscape characterized by rapid talus removal and undermining to a landscape characterized by slow talus removal and little slope undermining. As the drainage continues to improve around karst towers, steep tower hillslopes become more obscured at their bases by the accumulation of talus. (Sanderson-ISWS)
W75-07190

THE CHARACTER OF CHANNEL MIGRATION ON THE BEATTON RIVER, NORTHEAST BRITISH COLUMBIA, CANADA,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Geography.
E. J. Hickin, and G. C. Nanson.
Geological Society of America Bulletin, Vol 86, No 4, p 487-494, April 1975. 9 fig, 1 tab, 11 ref.

Descriptors: *Dendrochronology, *Meanders, *Forests, Age, Channel erosion, Flood plains, Alluvial channels, Deposition(Sediments), Geomorphology, Willow trees, *Canada, Channel morphology, Gradients(Streams), Streamflow, Aerial photography, Regression analysis, Mathematical models.
Identifiers: *British Columbia(Beatton River), *Channel migration, Channel curvature, Point bars, Scroll bars, Lateral migration, Poplar, Spruce, Alder.

Dendrochronological surveys on ten point-bar complexes on the Beatton River, northeast British Columbia, provided the basis for measurement of lateral migration and incision during the last 250 years. The rate of channel-bend migration reaches a maximum value where the ratio, radius of channel curvature to stream width (r sub m/w sub m), approximates 3.0. The rate of channel migration rapidly declines for bends with values of r sub m/w sub m greater or less than 3.0. In addition, the spacing of flood-plain ridges (d) increases with increasing rates of bend migration. Equations for predicting the migration rate (M, meters/year) on the study showed M as a power function of both r sub m/w sub m and d. Two sets of coefficients and exponents for r sub m/w sub m were used, depending on whether r sub m/w sub m fell in the range 1.3 to 2.9 or the range 2.9 to 7.9. (Visocky-ISWS)
W75-07191

EVALUATION OF THE CAUSES OF LEVEE EROSION IN THE SACRAMENTO-SAN JOAQUN DELTA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. T. Limerinos, and W. Smith.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-239 796, $4.25 in paper copy, $2.25 in microfiche. Water-Resources Investigations 28-74, January 1975. 30 fig, 10 tab, 9 ref.

Descriptors: *Erosion, *Levees, *California, *Boating, Stream erosion, Waves(Water), Bank erosion.
Identifiers: *Sacramento-San Joaquin Delta(Calif).

Erosion was studied in two typical channels in the Sacramento-San Joaqun Delta, California to determine the relative amount of damage caused by natural forces and by waves generated by boats. In a typical narrow channel, subject to winter floodflow and heavy boat traffic, about 20 percent of the annual energy dissipated against the levees could be attributed to boat-generated waves, about 10 percent to wind-generated waves, and 70 percent to tractive shear stress. In a channel relatively unaffected by winter floodflows, energy dissipation from boat-generated waves was shown to range from about 45 to 80 percent of the total, depending upon wind movement assumptions made in the computations. (Knapp-USGS)
W75-07210

A HYDROLOGIC ASSESSMENT OF THE SEPTEMBER 14, 1974, FLOOD IN ELDORADO CANYON, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 2E.
W75-07214

SEDIMENT YIELDS OF STREAMS IN THE UMPQUA RIVER BASIN, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 7C.
W75-07226

MASS PHYSICAL PROPERTIES, SLIDING AND ERODIBILITY OF EXPERIMENTALLY DEPOSITED AND DIFFERENTLY CONSOLIDATED CLAYEY MUDS,
Tuebingen Univ. (West Germany). Geologisch-Palaontologisches Institut.
G. Einsele, R. Overbeck, H. U. Schwarz, and G. Unsold.
Sedimentology, Vol 21, No 3, p 339-372, August 1974. 17 fig, 4 tab, 64 ref.

Descriptors: *Mass wasting, *Sedimentary structures, *Mud, *Clays, *Erosion rates, Physical properties, Shear strength, Deposition(Sediments), Consolidation, Flumes, Void ratio, Model studies, Slopes, Suspended load, Deformation, Compaction, Pore pressure, Sediment-water interfaces.

On experimentally deposited kaolinite, illite, and Ca-bentonite consolidated under their own load or by additional vertical pressure, the progress of compaction in relation to excess pore water pressure, mass physical properties, gravitational mass movements in a tilted tank, and erodibility under running water in a flume were studied. The very low consolidated sediments near the mud-water interface do not obey the generally used theory in soil mechanics. They show a different, nonlinear relationship between void ratio or water content and depth below the sedimentary surface on the one hand, or effective overburden pressure and shear strength on the other. The same is true of other physical properties such as permeability, which changes considerably with depth and time of consolidation. High sedimentation rates on slopes induce shallow sediment flow, whereas at low rates and critical slope angles different types of slope failures including the breaking up of water-rich sediment into sharp boundered blocks are observed. Flume studies on soft clay muds show three different types of erosion: continuously suspending, discontinuous erosion of crumbs or shreds, and wavy deformation of the clay surface with disintegration of particles from the crests. The critical tractive stress depends on clay type, void ratio, shear strength, and geologic history. (Visocky-ISWS)
W75-07266

2K. Chemical Processes

CATION CONCENTRATIONS OF SMALL STREAMS DRAINING MATCHED FORESTED AND CLEARCUT WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 4C.
W75-06853

INTRODUCTION TO THE ANALYTICAL METHODS FOR THE DETERMINATION OF MERCURY COMPOUNDS,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 5A.
W75-06919

NONFLAME METHODS FOR MERCURY DETERMINATION BY ATOMIC ABSORPTION: A REVIEW,
Perkin-Elmer Corp., Burlingame, Calif.
For primary bibliographic entry see Field 5A.
W75-06920

AN INSTRUMENTAL NEUTRON ACTIVATION METHOD FOR THE DETERMINATION OF MERCURY: WITH COMPARISONS TO ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Oregon State Univ., Corvallis. Radiation Center.
For primary bibliographic entry see Field 5A.
W75-06922

NEUTRON ACTIVATION ANALYSIS FOR THE DETERMINATION OF MERCURY IN ENVIRONMENTAL SAMPLES,
Washington State Univ., Pullman. Nuclear Radiation Center.
For primary bibliographic entry see Field 5A.
W75-06923

STUDIES ON THE HYDROLYSIS AND PRECIPITATION OF ALUMINUM (III),
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-06988

LIGHT INITIATED REACTIONS IN WATER CONTAINING CHELATED METAL IMPURITIES,
North Dakota State Univ., Fargo. Dept. of Chemistry.
R. D. Koob.
Research Report No. WI-221-021-74, November, 1974, 3 p, 1 ref. OWRT A-024-NDak (1).

Descriptors: Photometry, *Chemical reactions, Spectrophotometry, Gas chromatography, Metals, *Inorganic compounds, *Chromium, Chelation, *Analytical techniques, Chemical analysis, Light.
Identifiers: *Metal complexes.

Dilute solutions of ethylenediamine chromium (III), at a variety of pH's were irradiated in the visible wavelength region. Photolysis led to a mixture of products at pH's greater than two. The pH of the solution varied as irradiation proceeded. More detailed work at a pH of one showed that the overall reaction of chromium ethylenediamine complexes was the substitution of the ethylenediamine to form the hexaquochromium complex. The net reaction is simple. The mechanism appears more complex. It involves at least one intermediate in each step of the substitution of ethylenediamine by water. 1,1,1-triflouro-5, 5-dimethyl-2,4-hexanedio nato chromium (III), irradiated in both solution and gas phase at wave lengths shorter than 366 nm was found to undergo an isomerization reaction with a quantum yield of 0.03 to 0.06. The results also demonstrated that this molecule could undergo the isomerization raction when light was absorbed by other molecules in the system. The first set of experiments was done using spectrophotometric analysis, the second set was done using gas chromatography.
W75-06994

AN X-RAY DIFFRACTION STUDY OF WATER STRUCTURES AND SOLVATED IONS IN AQUEOUS SOLUTIONS,
North Dakota Univ., Grand Forks. Dept. of Physics.
H. D. Bale.
Research Report No. WI-221-020-74, November, 1974, 3 p. OWRT A-021-NDak (1).

Descriptors: *Water structure, *X-ray diffraction, Hydration, *Aqueous solutions, *Ions, Water chemistry, Salts, Chlorides, Measurement, X-ray analysis.

X-ray studies have been performed on both LiCl solutions and on pure water. The larger angle measurements made on the salt solutions were used to determine the radius of the first hydration shell surrounding the foreign ions. It was also shown that the temperature dependence of the hydration radius was in agreement with the Debye-Huckel Theory. Sufficient data were not obtained to definitely establish the degree to which the results were affected by error. Small angle X-ray measurements were made on water in the temperature range from 0 to 92 degrees Centigrade. No evidence for a mixture model for water was found. The temperature dependence of the zero angle scattering agreed with what was theoretically expected for a simple, one-component fluid. The hydration or solvation layer around foreign ions in aqueous solution gives water the ability to hold large amounts of impurities in solution. If the solvation layer could be greatly reduced or removed the impurities in the solution would precipitate out. The X-ray method used gives a means of measuring the solvation layer and as such would be useful if a study were undertaken to modify or remove the hydration shell.
W75-06997

COPPER IN SURFACE WATERS SOUTH OF NEW ZEALAND,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
E. Boyle, and J. M. Edmond.
Nature, Vol 253, No 5487, p 107-109, January 10, 1975. 2 fig, 1 tab, 10 ref.

Descriptors: *Copper, *Sea water, *Oceanography, *Surface waters, Silicates, Phosphates, Salinity, Nitrates, Alkalinity, Ships, Oceans, Pacific Ocean, Upwelling, Ocean circulation, Sampling.
Identifiers: New Zealand.

The sampling of the transition metals, including copper, in the ocean has so far produced unsatisfactory results. For copper, contamination during sampling has been suggested as one source of error, and this was overcome by sampling surface waters in regions of marked horizontal gradients in chemical properties. Samples were collected on station from the bow of the ship. The sampler was a 4-1 polyethylene jerry jug which had been leached with 0.1 N hydrochloric acid for 24 h, rinsed four times with very pure distilled water, and stored in a polyethylene bag. The jug was filled at a depth of at least 3 m. It was definitely established that relative to lower latitudes, copper is enriched in the surface waters of the Antarctic upwelling areas, and, by extension, in the deep waters of the ocean. If the correlation with nitrate is valid, then copper can be classified as a limiting nutrient. The levels in the surface water in low and midlatitudes should be very close to zero (less than 0.1 nmol per kg) and the maximum values in the deep Pacific should not exceed 5 nmol per kg. (Sims-ISWS)
W75-07060

CUMULATIVE CHEMICAL LIGHT METER,
Westinghouse Research Labs., Pittsburgh, Pa.
For primary bibliographic entry see Field 5A.
W75-07063

MAJOR AND HISTORICAL SPRINGS OF TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 4B.
W75-07152

EXAMINATION OF WATERS: EVALUATION OF METHODS FOR SELECTED CHARACTERISTICS.
Australian Water Resources Council, Canberra (Australia).
For primary bibliographic entry see Field 5A.
W75-07154

AN EVALUATION OF NEW METHODS FOR THE DETERMINATION OF AMMONIA IN WATER,
Brisbane City Council (Australia).
For primary bibliographic entry see Field 5A.
W75-07157

INSTRUMENTAL METHODS FOR THE DETERMINATION OF TRACE METALS IN WATER,
New South Wales Dept. of Mines, Sydney (Australia). Chemical Lab.
For primary bibliographic entry see Field 5A.
W75-07159

THE AUTOMATION OF ROUTINE COLORIMETRIC ANALYSIS OF WATER,
New South Wales Dept. of Mines, Sydney (Australia). Chemical Lab.
For primary bibliographic entry see Field 5A.
W75-07162

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. II ISOPRENOIDS,
California Univ., Los Angeles. Dept. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W75-07168

GEOCHEMICAL ANALYSIS OF STREAM SEDIMENTS AS A TOOL FOR ENVIRONMENTAL MONITORING: A PIGYARD CASE STUDY,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 5A.
W75-07188

RATE OF SULFURIC-ACID PRODUCTION IN YELLOWSTONE NATIONAL PARK,
Wisconsin Univ., Madison. Dept. of Bacteriology.
T. D. Brock, and J. L. Mosser.
Geological Society of America Bulletin, Vol 86, No 2, p 194-198, February 1975. 2 fig, 4 tab, 14 ref. NSF Grant GB-35046.

Descriptors: *Acidic water, *Acid bacteria, *Thermal springs, Tracers, Volume, Seepage, Ponds, Hydrothermal studies, Hydrogen sulfide, Water table, Leaching, Hydrogen ion concentration, Sulfur bacteria, Acidic soils, Thermometers, Chemical analysis, Sodium chloride.
Identifiers: *Yellowstone National Park, *Sulfuric acid, Dilution rate.

Production of sulfuric acid in vapor-dominated hydrothermal systems is primarily a bacterial process. The rate of production of sulfuric acid was measured in springs in several acid-altered areas in Yellowstone National Park. Most of these springs lack surface water flow, but water enters and leaves these springs at approximately constant rates via underground seepage. The rate of water exchange in these steady-state systems was measured by enriching the springs with sodium chloride and measuring the rate at which the chloride ion was diluted. In all cases, the added chloride was diluted at an exponential rate. The rate at which sulfuric acid was being produced was calculated from a knowledge of the dilution rate and volume of the springs and from measurement of the sulfuric-acid concentrations of the waters. Water in acid springs enters as cold, acid groundwater which is steam heated within the source pool. In springs with pool volumes of 2000 liters or less, most of the sulfuric acid was produced outside the spring, probably by bacteria present in the nearby acid-altered soil. In springs with pool volumes around 1,000,000 liters most of the sulfuric acid was produced in situ by resident bacterial populations. (Visocky-ISWS)
W75-07189

PRINCIPAL-COMPONENT ANALYSIS OF STREAMFLOW CHEMICAL QUALITY DATA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-07200

QUALITY OF THE GROUND WATER IN BASALT OF THE COLUMBIA RIVER GROUP, WASHINGTON, OREGON, AND IDAHO,
Geological Survey, Reston, Va.
R. C. Newcomb.
Available from Supt. of Documents, GPO, Washington DC 20402, for 75 cents. Water-Supply Paper 1999-N, 1972. 71 p, 9 fig, 1 plate, 3 tab, 29 ref.

Descriptors: *Water chemistry, *Water quality, *Basalts, *Groundwater, Washington, Oregon, Idaho, Geochemistry, Hydrogeology, Hot springs, Bicarbonates, Calcium, Sodium, Columbia River.
Identifiers: *Columbia River aquifer.

The groundwater within the 50,000-square-mile area of the layered basalt of the Columbia River Group in Washington, Oregon, and Idaho is a generally uniform bicarbonate water having calcium and sodium in nearly equal amounts as the principal cations. The water contains a relatively large amount of silica. The sodium water is more common beneath the floors of the main synclinal valleys; the calcium water, elsewhere. In addition to the prevalent type, five special types form a small part of the groundwater; four of these are natural and one is artificial. The four natural special types are: (1) calcium sodium chloride waters that rise from underlying sedimentary rocks west of the Cascade Range, (2) mineralized water at or near warm or hot springs, (3) water having unusual ion concentrations, especially of chloride, near sedimentary rocks intercalated at the edges of the basalt, and (4) more mineralized water near one locality of excess carbon dioxide. The one artificial kind of special groundwater has resulted from unintentional artificial recharge incidental to irrigation in parts of central Washington. Carbon-14 determinations indicate that the water has been underground for periods ranging from modern times to several tens of thousands of years. (Knapp-USGS)
W75-07217

GEOLOGIC SETTING AND CHEMICAL CHARACTERISTICS OF HOT SPRINGS IN WEST-CENTRAL ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2F.
W75-07243

AN AUTOMATED TECHNIQUE FOR TOTAL DISSOLVED FREE AMINO ACIDS IN SEA-WATER,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5A.
W75-07247

2L. Estuaries

POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND.
For primary bibliographic entry see Field 5C.
W75-06881

THE DISTRIBUTION OF MERCURY IN SEDIMENT CORES FROM BELLINGHAM BAY, WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-06901

ECOLOGICAL VARIABILITY OF PIKE-PERCH IN LITHUANIAN WATER. (3. NOURISHMENT OF PIKE-PERCH IN THE LAGOON OF KURIS.HES-HAFF.)), (IN RUSSIAN),
Akademiya Nauk Litovkkoi SSR, Vilnius. Institut Zoologii i Parazitologii.
A. B. Gyarulaitis.
Liet Tsr Moksiu Akad Darb Ser B. 4 p 97-110, 1972. English summary.

Descriptors: *Fish, *Pike, *Perch, *Ecosystems, Lagoons, Europe, Ecology.
Identifiers: Acerina-cernua, *Lithuania, Lucioperca-lucioperca, Osmerus-eperlanus, Perca-fluviatilis, Rutilus-rutilus.

The composition of food of young and older fish (Lucioperca lucioperca), the dependence of nourishment upon the age of the predator, the quantity of food components, the proportion of body length of the victim and the predator, the dimensional-age and seasonal pecularities were studied. In the Kursiu Marios Lagoon (USSR) pike-perch become predatory between 5.1-6.0 cm in length and in the open sea they live mostly on European small smelt (Osmerus eperlanus m. spirinchus Pallas). Matured pike-perch live mostly on roach (Rutilus rutilus (L.)), ruff (Acerina cernia (L.)), perch (Perca fluviatilis L.), European small smelt, European big smelt (O. eperlanus (L.)) and its youngsters. The composition of food and the intensity of feeding in different years and in different parts of the sea is different and depends upon seasonal changes of food base. Younger pike-perch feed on European small smelt, ruff and perch, while older ones eat roach, European big smelt and the youngsters of pike-perch. Pike-perch live mostly on fish of small dimensions or on the youngsters of bigger fish. The body length of victims ranges from 2-18 cm and on the average constitutes 9.7-61.6% of the pike-perch body length.--Copyright 1973, Biological Abstracts, Inc.
W75-06961

RIVER AND ESTUARY MODEL ANALYSIS, VOLUME 3.
For primary bibliographic entry see Field 2E.
W75-06998

THE TIDAL REGIME OF THE ELBE-RIVER, HYDRAULIC MODEL WITH MOVABLE BED,
Bundesanstalt fur Wasserbau, Hamburg (West Germany).
E. Giese, J. Teichert, and H. Vollmers.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 25-36. (1973). 10 fig, 3 ref.

Descriptors: *Model studies, *Tidal streams, *Sediment transport, Rivers, Estuaries, Instrumentation, Hydraulic similitude, River training, Hydraulic models, Alluvial channels.
Identifiers: Movable bed models.

An estuary tidal model of the Elbe River was used for schemes of suitable actions in regard to enlargement and maintenance of required navigable water depth and width for high capacity ships. The horizontal scale of the model is 1:800 and the vertical scale 1:100. Discussed were similarity considerations, hydrological and morphoiogical information, model construction, instrumentation, control for dynamical and morphological similarity, and model tests conducted to determine stabilization effects of the navigation channel northwest of Cuxhaven. Tests determined that alignment of a training wall combined with widening and deepening of the center channel was the most satisfactory scheme investigated. (See also W75-06998) (Humphreys-ISWS)
W75-07001

A SMALL SCALE HYDRAULIC MODEL IN MARINE TRANSPORTATION STUDIES,
Canadian Marine Transportation Administration, Ottawa (Ontario).
A. D. Watt.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 37-48. (1973). 1 fig.

Descriptors: *Hydraulic models, *Sediment transport, *River basin development, *Navigation, Model studies, Transportation, *Canada, Calibrations, St. Lawrence River, River regulation, Channel improvement, Navigable rivers.
Identifiers: Movable bed models.

Developmental and operational aspects were presented of a movable bed hydraulic model designed to study the feasibility of a major waterway deepening project in the St. Lawrence River below Quebec. The model investigations were directed toward establishing the effects of removal, and subsequent disposal, of 13 million cubic yards of dredged material on the present state of quasi-equilibrium of the navigation channel. The model itself is of general interest due to the selection and successful application of extremely small scales and a distortion of 20. Considerations given to model size and cost in relation to theoretical and empirical conditions for similitude and choice of model and bed material scales were discussed in general terms, and specifically in regard to the model of a 200-mile reach of the St. Lawrence River. The model has been successful in resolving to a considerable extent the complex mechanism of bed load movement in the reach of the St. Lawrence below Quebec, as well as specifying the locations for disposal of dredging material to avoid costly maintenance in future years. (See also W75-06998) (Humphreys-ISWS)
W75-07002

STUDIES FOR CHALNA PORT IN THE DELTA OF GANGES RIVER,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia). Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W75-07003

DETERMINATION OF DISCHARGE SCALE FOR A TIDAL MODEL OF A COMPLEX RIVER,
Irrigation and Power Research Station, Poondi (India).
G. Ganapathisubramanian.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 97-108. (1973) 5 fig.

Descriptors: *Model studies, *Tidal streams, *Hydraulic models, *Flow profiles, Tidal effects, Discharge(Water), Rivers, River regulation, River flow, River forecasting, Roughness coefficient, Maximum probable flood, River training, Flood stages, Flood routing, Numerical analysis.
Identifiers: *India(Cooum River).

Cooum River in Tamilnadu, a tidal river along the eastcoast of India, was studied to determine the efficacy of the various appurtenant works suggested for keeping the river mouth open for flushing during the tidal propagation. The problem is complicated due to the fact that there is a littoral drift along the eastcoast of India and the drift is estimated to be about one million tons at the Cooum River mouth. The net movement of sand is northwards for most of the year. Added to this, the Madras Harbor lying on the northern side of the river mouth prevents the movement of sand

towards the north, causing the river mouth to close. The data regarding the river flow and the corresponding water levels were few and not sufficient for calibrating such a complicated tidal river model. Conventional methods of calibration could not be adopted for this case. Hence, recourse was made to a combination of physical model results and results obtained with a digital computer to arrive at the maximum probable discharge that would have occurred in the prototype, the Manning's n value for the prototype, and the discharge scale ratio for the model. The special technique adopted for calibrating this tidal river model and for determining the discharge scale ratio for the model were described. (See also W75-06998) (Humphreys-ISWS)
W75-07007

THE INFLUENCE OF TIDAL INLET CURRENTS ON THE PROPAGATION OF WAVE ENERGY INTO ESTUARIES - PHYSICAL MODEL INDICATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. Z. Hales, and J. B. Herbich.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 171-182, (1973). 7 fig, 5 ref.

Descriptors: *Model studies, *Inlets(Waterways), Tidal effects, Hydraulic models, Bays, Estuaries, Tides, Currents(Water), Waves(Water), Oceans, Flood flow, Flow characteristics, Laboratory tests, Evaluation, Instrumentation.
Identifiers: Ebb flow.

An experimental study was conducted in a three-dimensional wave basin to investigate the manner in which the characteristics of a surface gravity wave train are altered as the waves propagate onto a flood or ebb current produced by tidal flow through relatively narrow inlets connecting relatively large bays or estuaries with the open ocean. Changes in the wave characteristics of length, height, and celerity have a direct bearing on the rate of energy propagation through the inlet into the bay or harbor, and also contain implications regarding the flushing of sediment from the entrance channel and hazards to navigation. Results of critical experiments were combined with analytical studies and displayed in dimensionless form to indicate the effect of pertinent nondimensional terms on this physical phenomena. (See also W75-06998) (Humphreys-ISWS)
W75-07013

ON AN EFFECT OF RIVER DISCHARGE TO TSUNAMI IN A MODEL OF URADO BAY,
Kyoto Univ. (Japan). Disasters Prevention Research Inst.
S. Nakamura.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 183-194, (1973). 8 fig, 1 tab, 18 ref.

Descriptors: *Model studies, *Bays, *Tsunamis, Ocean waves, Hydraulic models, Rivers, Wave pile-up, Hydraulic structures, Breakwaters, Flood discharge, River flow, Shore protection, Flow profiles, Laboratory tests.
Identifiers: *Japan(Urado Bay).

By the use of the Urado Bay model which reproduces Chilean Tsunami, an experimental study was carried out on transformation of tsunami by the effect of river discharging into Urado Bay. The flow profile for the design flood discharge was studied experimentally under the condition that the water level at the bay mouth be kept at the mean high water level. Effect of tsunami breakwaters at the bay mouth to the flow profile was estimated experimentally and numerically to determine piling up of water in the bay. Effects of tsunami breakwaters at the bay mount to transformation of tsunami and to river discharge were estimated from the result of the experiment and to that of the past researches concerning the interaction between wave and current. It was found that the effect of the tsunami breakwaters was much less when river discharges exist. When the amount of the river discharges was equal to the design flood discharges, the tsunami wave height decrements were similar (1) when the river discharges existed and the tsunami breakwaters were not constructed and (2) when the river discharges did not exist and the tsunami breakwaters were constructed. (See also W75-06998) (Humphreys-ISWS)
W75-07014

SYSTEM 11 'SIVA', A DESIGN SYSTEM FOR RIVERS AND ESTUARIES,
Technische Hogeschool, Delft (Netherlands). International Courses in Hydraulics.
For primary bibliographic entry see Field 2E.
W75-07016

MODELING RIVER AND ESTUARY UNSTEADY FLOW SYSTEMS,
Utah State Univ., Logan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07024

MATHEMATICAL INVESTIGATION OF A TIDAL RIVER,
Calcutta Port Commissioners (India). Hydraulic Study Dept.
A. K. Chatterjee.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 315-326, (1973). 5 fig, 3 ref.

Descriptors: *Model studies, *Tidal streams, *Tidal effects, Mathematical models, Equations, Finite element analysis, Numerical analysis, Tides, Rivers, Channels, Water levels, Discharge(Water), Streamflow, Analytical techniques.
Identifiers: *India(Rupnarain River), Explicit method.

A mathematical model was given for the simulation of the propagation of tides in long irregular channels, incorporating the bed slope in the schematization process which varies from reach to reach and the friction factor varying from reach to reach as well as with time. In several solutions, the bed slope term was neglected and its effect was compensated as far as possible by adjustment of the friction factor (a constant value of the Chezy's C). The method of solution was the explicit finite difference scheme with diamond grids. The computed tidal curves at Dhanipur and Gopinathpur on the Rupnarain River agree within plus or minus 4% of the prototype water levels. This discrepancy was felt to be due to nonsimulation of the correct bed slope. The noticeable influences of the slope term were the lowering of the ebb arm of the tide curves and the increase in the volume of the ebb flow. (See also W75-06998) (Humphreys-ISWS)
W75-07025

THEORETICAL STUDIES OF LONG WAVE PROPAGATION IN ESTUARIES OF FINITE LENGTH,
Birmingham Univ. (England). Dept. of Civil Engineering.
D. W. Knight.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydrauiic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 327-338, (1973). 8 fig, 6 tab, 1 ref.

Descriptors: *Mathematical studies, *Estuaries, *Theoretical analysis, *Tidal effects, Waves(Water), Tides, Water levels, Equations, Tidal waters, Water level fluctuations, Hydraulic models, Continuity equation, Momentum equation, Mathematics.

Proudman's (1957) analytical solution was described and amplified for the problem of tidal propagation in an idealized estuary which is a horizontal channel of constant rectangular section, closed at one end and open at the other to a periodic influence. The motion was considered to be one dimensional and the solution includes the effect of both the convective acceleration and the friction terms. Equations were presented giving the amplification of the tide as it progresses up the estuary, the times of high and low water, and the heights of high and low water. The influence of various dimensionless groups was demonstrated by a graphical presentation of the results. A comprehensive set of numerical results were tabulated for comparison with other analytical solutions to the same problem and for comparison with experimental results. (See also W75-06998) (Humphreys-ISWS)
W75-07026

FLOOD ROUTING FOR URBAN RIVER NETWORK,
Osaka Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07027

CIRCULATION IN SHALLOW ESTUARIES,
Texas Univ., Austin. Dept. of Civil Engineering.
F. D. Masch, and N. J. Shankar.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 371-381, (1973). 4 fig, 2 tab, 4 ref. OWRR C-1158(No 1591)(4).

Descriptors: *Estuaries, *Model studies, *Circulation, *Texas, Mathematical models, Tidal effects, Shallow water, Numerical analysis, Currents(Water), Velocity, Tidal waters, Water quality, *Path of pollutants.
Identifiers: *Galveston Bay(Tex), Tidal models.

Results were presented for a numerical tidal simulation model for the analysis and evaluation of circulation patterns in shallow homogeneous estuaries such as those found along the Gulf Coast of the United States. Basic model output consists of the time history of tidal amplitudes and component tidal velocities under vertically integrated conditions. The velocity components for each grid element are resolved vectorially and plotted on an overlay of the bay system to illustrate circulation patterns. Such plots involving net (time averaged over a tidal cycle) velocity vectors are representative of the overall circulation patterns while plots utilizing instantaneous velocities or velocities at different phases during a tidal cycle (i.e., flood, ebb, and slack conditions) provide a more detailed description of the local circulation. These circulation patterns are all fundamental to the analysis of transport characteristics including salinity and water quality in estuaries. After calibration with actual prototype data, the model was operated for an intermediate inflow condition in order to establish baseline circulation patterns in Galveston Bay, Texas. Two practical examples in which shell reefs were removed were then simulated to show the effects of dredging on established circulation. Further analysis of the circulation patterns per-

mitted estimates to be made of the physical exchange across the dredged areas and in other parts of the bay system. (See also W75-06998) (Humphreys-ISWS)
W75-07030

MATHEMATICAL MODELLING FOR SHORT-TERM TRANSPORT IN VERTICALLY MIXED ESTUARIES,
Madras Univ., Guindy (India). Dept. of Hydraulic Engineering.
M. Narayanan.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 429-440, (1973). 5 fig, 7 ref. OWRR C-1158(No 1591)(3).

Descriptors: *Estuaries, *Model studies, *Tidal waters, *Dispersion, *Texas, Mathematical models, Path of pollutants, Effluents, Waste disposal, Water pollution, Tides, Pollutants, Hydraulics, Numerical analysis, Equations, Dissolved solids, Salinity.
Identifiers: *Matagorda Bay(Tex).

A two-dimensional convective-dispersion transport model was described which provides spatial and temporal variations in the concentration of a conservative constituent introduced into a shallow well-mixed estuary. The solution was accomplished through a multistage implicit method and the model used as basic input instantaneous tidal velocities, depths, and dispersion coefficients computed from an operational mathematical tidal hydrodynamics model. The application of the model was demonstrated by slug and continuous releases of conservative materials into high and low tidal velocity areas in Matagorda Bay, Texas. (See also W75-06998) (Sims-ISWS)
W75-07033

CHARACTERISTICS OF THE INTERFACIAL REGION OF A TWO-LAYER FLOW SYSTEM,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
R. J. Vass.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 441-451, (1973). 4 fig, 8 ref.

Descriptors: *Saline water-freshwater interfaces, *Model studies, *Estuaries, *Density stratification, Mathematical models, Laboratory tests, Boundaries(Surfaces), Flow, Freshwater, Saline water, Density, Velocity, Rivers, Fluid mechanics, Hydraulic models, Transition flow.
Identifiers: *River mechanics.

A study was presented of the behavior of the interfacial region occurring between two fluids of slightly differing densities (fresh and salt water) under various hydraulic conditions. The configuration resembles the central position of an arrested saline wedge that might occur where a freshwater river enters a sea. The prime aim of the study was to investigate the development of the 'transition' region at the interface with distance along the interface under variations of density and upper layer velocities. An approximation method was used to simplify equations and a numerical solution was given for (1) the development of the transition region and (2) the velocity profiles at any point along the interface. Laboratory experiments were conducted to test the theoretical analyses for density differences ranging from 0.15 to 0.75% and for upper layer velocities up to approximately 6 cm/sec. The results presented for one test show reasonable agreement with the theory. (See also W75-06998) (Sims-ISWS)
W75-07034

A MATHEMATICAL MODEL TO PREDICT DISCHARGE VARIATIONS IN AN ESTUARY WITH SHALLOW WATER AND A LARGE TIDAL RANGE,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).
F. Ferrari.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 453-464, (1973). 3 fig, 2 tab, 14 ref.

Descriptors: *Estuaries, *Tidal effects, *River flow, *Model studies, Rivers, Deltas, Mathematical models, Continuity equation, Flow, Discharge(Water), Streamflow forecasting, Powerplants, Thermal powerplants, Cooling water.
Identifiers: *Italy(Po River), Adriatic Sea.

The river Po enters the Adriatic sea with a delta; the Po di Pila branch is the main branch of the delta network. A bars band partially obstructs the river mouth. The tidal effects propagate for about 50 km upstream of the mouth. Given the average daily discharge of the Po in an upstream section at which the tidal effects can be neglected, it is desired to assess the variations of the instantaneous discharge in the branch of the Po di Pila caused by the tide in the sea area in front of the delta. The flow in this branch of the river was studied with a simplified mathematical model based on the hydraulic scheme of a cylindrical channel with large-sill submerged weir. The continuity equation takes into consideration the prism shape of the backwater in the river and the flow through the large-sill weir. The verification of the given method was carried out by using the results of 7 field records of the instantaneous discharge made from 1970 to 1971 in the channel of the Po di Pila. The range of the data for daily average discharge extends from 500 cu m/sec to 2300 cu m/sec. The results are satisfactory as far as the evaluation of the minimum and maximum values of instantaneous discharge and the maximum variation of discharge during the tidal cycle is concerned. (See also W75-06998) (Sims-ISWS)
W75-07035

FINITE ELEMENT NUMERICAL MODELLING OF FLOW AND DISPERSION IN ESTUARIES,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
C. Taylor, and J. Davis.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 465-476, (1973). 4 fig, 8 ref.

Descriptors: *Estuaries, *Model studies, *Dispersion, *Finite element analysis, Effluents, Mathematical studies, Equations, Waste disposal, Pollutants, Tidal effects, Numerical analysis, Hydraulics, Mathematical models, Estuarine environment.

The finite element numerical method was used to formulate, in matrix form, the equations governing the dispersion of effluent within a bounded tidal domain. The relevant equations were those depicting conservation of momentum and mass and the advective diffusion equation for each effluent species. Each equation was assembled in matrix form and subsequently solved, either coupled or uncoupled, with appropriate iterative implicit techniques. The applicability of the technique was tested by comparison with known analytic solutions and other physical or numerical models. Experience with the tidal model showed that the finite element method offers distinct advantages in reproducing physical processes. A particular mesh can be refined in a region of interest and actual boundary geometry is more easily followed. (See also W75-06998) (Sims-ISWS)
W75-07036

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. VI, SIMULATION, OBSERVATION, AND STATE ESTIMATION,
New York City-Rand Inst., N.Y.
For primary bibliographic entry see Field 5B.
W75-07042

ESTIMATION OF SEA SURFACE TEMPERATURE FROM REMOTE SENSING IN THE 11- TO 13-MICROMETER WINDOW REGION,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W75-07043

COPPER IN SURFACE WATERS SOUTH OF NEW ZEALAND,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 2K.
W75-07060

SUMMARY AND ANALYSIS OF PHYSICAL OCEANOGRAPHY DATA COLLECTED IN THE NEW YORK BIGHT APEX DURING 1969-70,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
R. L. Charnell, and D. V. Hansen.
Available from NTIS, Springfield, Va 22161 as COM-75-10358, $375 in paper copy, $2.25 in microfiche. MESA Report No. 74-3, August 1974, 49 p.

Descriptors: *Oceanography, *Circulation, *Water flow, *Stratification, Ocean currents, Oceans, Temperature, Salinity, Seasonal variations, Estuaries, Bottom water, Runoff, Water masses, Tidal currents, Turbidity currents, Hudson River, New York.
Identifiers: *Physical oceanography, *New York Bight, Hudson River discharge, Water movement.

An analysis is presented of physical oceanography data collected on a monthly basis in the apex of the New York Bight during 1969 and early 1970. Data include temperature and salinity values, recovery information on surface and seabed drifters, and current meter observations. Hudson River discharge and wind data from Ambrose light station are also included. The data show apex water to be stratified three-fourths of the year caused by high river runoff and insolation. During winter, heat loss and wind mixing destroy and impede reformation of stratification. There is a strong northward flow of water in the lower layers along the axis of the Hudson shelf channel; some of this bottom water flows into the Hudson estuary and part turns eastward to flow parallel to Long Island. Eventually, this eastward flow turns and joins the southwest flow of shelf water, suggesting that an anticyclonic circulation exists in the apex most of the year. Surface flow exhibits high seasonality in response to surface winds, with northward flow during spring and summer and southeast movement during fall and winter. Surface flow from Raritan Bay flows south along the New Jersey coast most of the year. (NOAA)
W75-07069

STATISTICAL PROPERTIES OF WAVE-CURRENT FORCE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering, and North Carolina State Univ., Raleigh. Dept. of Geosciences.
Chi C. Tung, and N. E. Huang.
North Carolina University Sea Grant Reprint No. 53, 15 p. Reprint from: Journal of the Waterways

Harbors and Coastal Engineering Division, ASCE, Proceedings Paper 9931, p 341-354, August 1973. 9 fig, 7 ref, 3 append.

Descriptors: *Waves(Water), *Currents(Water), Water level, Coasts, Engineering.
Identifiers: *Fluid force, Wave-current interactions, Random wave field, Stationary random waves.

The influence of current on such statistical quantities as the mean, standard deviation, skewness, and probability function of random fluid force, are studied both with and without considering wave-current interactions. The importance of current and wave-current interactions on these quantities is clearly demonstrated. For simplicity, only deep water stationary random waves under the influence of a steady current uniformly distributed in depth are examined. The fluid force is evaluated at an element of a cylinder of unit diameter and unit length situated immediately beneath the mean water level. (NOAA)
W75-07070

STABILIZATION OF COASTAL DREDGE SPOIL WITH SPARTINA ALTERNIFLORA,
North Carolina State Univ., Raleigh. Dept. of Botany; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
E. D. Seneca.
North Carolina University Sea Grant Reprint No. 44, 6 p, 9 ref. Reprinted from Ecology of Halophytes, p 525-529, 1974. Academic Press, Inc. NOAA SG GH-78.

Descriptors: *Estuaries, *Salt marshes, *Grasses, *North Carolina, Coasts, Intertidal areas, Plant growth, Channel improvement.
Identifiers: *Dredge spoil, *Spartina alterniflora, Channel maintenance, Transplanting.

Stabilization of dredge spoil along the North Carolina coast with Spartina alterniflora Loisel can be obtained within two years. Experimental plantings made with transplants from nature were designed to study source of transplants, spacing, time of year to plant, depth to plant, and the correlation between plant response over an elevational gradient and tidal amplitude. Plant response was measured over substrate material with various physical and chemical differences. On coarse substrate material, planting operations can be mechanized by using a tractor and a modified tobacco planter. Seeding experiments revealed that seedling establishment is restricted to a much narrower elevational range than that over which transplants are successful. Laboratory studies indicated that seed germinate well in the 35-20 deg C alternating diurnal thermoperiod but that they must be kept moist during storage prior to germination. Controlled seedling growth experiments indicated best growth under long-day conditions in a 26-22 deg C or 30-26 deg C alternating diurnal thermoperiod. Planting of the intertidal zone of dredge spoil with S. alterniflora not only can result in stabilization of the spoil material, but also initiates the development of estuarine salt marsh. (NOAA)
W75-07071

SEDIMENT MOVEMENT IN TUBBS INLET, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
R. P. Masterson, Jr., J. L. Machemehl, and V. V. Cavaroc.
North Carolina University Sea Grant Reprint No. 51. North Carolina State University Center for Marine Coastal Studies Report No. 73-2, June 1973. 120 p, 27 fig, 6 tab, 24 ref, 5 append.

Descriptors: *Sediment transport, *Estuaries, *Tidal effects, *Inlets(Waterways), Coasts, Tracers, Intertidal areas, Sedimentary structures, *North Carolina.
Identifiers: Coastal processes, Tidal currents, *Littoral transport, Tubbs Inlet(NC), Fluorescent tracers, Sea Grant Program, Bypassing.

A pattern of sediment movement and sediment transport rate into the estuary through Tubbs Inlet was established by mapping bedform and sedimentary structure orientation, analysis of tidal-current direction and velocity throughout a complete tidal cycle, and analysis of fluorescent tracer sand movement. The generalized sediment transport pattern indicated movement into the estuary across the intertidal sand flats of the inlet by flood-tidal currents. During flood tide waves are refracted around the ebb-tidal delta and focused toward the inlet. Breaking waves place sediment into suspension which is then transported by tidal currents. Sediment is moved landward through the main channel; however, net movement through the gorge is seaward. Current velocities in the main channel are maximum during ebb flow. Flood currents in the gorge range from 50 cm/sec to 75 cm/sec. Sediment is moved seaward, primarily through the main channel, and reintroduced into the littoral transport system bypassing the inlet. Concentrated zones of tracer sand were detected as the 'sand mass' moved along the recurved spit on the eastern side of the inlet. The rate of net transport of these zones was approximately 0.6 cm/sec. The movement rate of the concentrated zones was much less than the rates calculated for individual tracer grains. (NOAA)
W75-07072

A NEW TECHNIQUE FOR BEACH EROSION CONTROL,
North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
For primary bibliographic entry see Field 2J.
W75-07073

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT,
Coastal Zone Management Inst., Sandwich, Mass.
J. Armstrong, H. Bissell, R. Davenport, J. Goodman, and M. Hershman.
November 1974. 390 p, 10 fig, 5 tab, 376 ref, 3 append. $10.00. NOAA 3-37157.

Descriptors: *Coasts, *Planning, *Management, *Boundaries(Property), Estuaries, Legislation, Information exchange, Legal aspects, Water law, Boundary disputes, Bibliographies.
Identifiers: *Coastal zone management, Land and water uses, Geography, Public performance, *Sanctuaries.

A technical guide is presented for use by state and local officials involved in the development and implementation of coastal zone management programs. It has been organized in such a way as to parallel the requirements for management program development which are contained in the Coastal Zone Management Act of 1972 and the Section 305 regulations published November 29, 1973, in the Federal Register (15 CFR 920). Additional information on the design of a management program consistent with the Act's requirements is contained in the criteria for management program approval published in draft form August 21, 1974, in the Federal Register (15 CFR 923). The Coastal Zone Management Act of 1972 is reproduced in the appendix. A bibliography is organized according to geographical areas. (NOAA)
W75-07075

PLANNING FOR SHORELINE AND WATER USES.
For primary bibliographic entry see Field 6B.
W75-07086

THE LIMNOBIOLOGY OF DEVILS LAKE CHAIN, NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W75-07102

OYSTER REEF SEDIMENTATION, BILOXI BAY, MISSISSIPPI,
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
C. M. Hoskin.
Southeastern Geology, Vol 16, No 1, p 41-57, August 1974. 7 fig, 32 ref. OWRT A-051-MISS(3).

Descriptors: *Sedimentology, *Bays, *Reefs, *Oysters, Estuaries, Banks, Shellfish, Deposition(Sediments), Sediment transport, Silts, Clays, Sands, Gravels, Suspended solids, *Mississippi.
Identifiers: *Biloxi Bay(Miss), Shells.

Size-frequency distributions were determined for bottom sediments, collected by grab, from three living oyster reefs (27 samples) and from two non-reef sites (33 samples). Oyster reef sediments were found to contain 10% gravel (shells), about 60% sand (mixture of fragmented shells and quartz), 15% silt, and 15% clay. Nearby non-reef sediment contained only traces of gravel, about 35% sand, 28% silt, and 38% clay. Size-frequency distributions of reef sediment were leptokurtic, and those for non-reef sediments were platykurtic. Grainsize parameters of mean size, standard deviation and skewness did not distinguish between reef and non-reef sediments. Measured current velocities ranged up to 0.94 ft/sec at the surface, and near bottom currents met the threshold velocity of 0.5 ft/sec for erosion and transport of fine sand. Suspended sediment loads ranged between 58 and 183 mg/l, tending to be greater downwind in both reef and non-reef environments. Suspended sediment load varies with the wind, decreasing with decreasing wind velocity. (Sims-ISWS)
W75-07148

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. I PIGMENTS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W75-07167

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. III ALIPHATIC AND STEROIDAL ALCOHOLS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W75-07169

TIDAL AND DIURNAL EFFECTS ON ZOOPLANKTON SAMPLE VARIABILITY IN A NEARSHORE MARINE ENVIRONMENT,
Bedford Inst., Dartmouth (Nova Scotia).
D. D. Sameoto.
Journal of the Fisheries Research Board of Canada, Vol 32, No 3, p 347-366, March 1975. 5 fig, 6 tab, 17 ref.

Descriptors: *Zooplankton, *Sampling, *Variability, *Estuarine environment, Copepods, Fluctuations, Correlation analysis, Tides, Tidal effects, Diurnal, Oceanography, Nets, Statistical analysis, Biomass, Aquatic life, *Canada.
Identifiers: St. Margaret's Bay(Canada), Nova Scotia.

Two 26-h series of duplicate and replicate vertical zooplankton samples taken at two stations at two different times of the year showed that a periodic fluctuation correlated to the tide was present in the biomass of zooplankton and in the numbers of animals of several copepod species. Diurnally migrating species of zooplankton did not show a tidal correlation. The hour to hour fluctuations in zooplankton were generally more important than the difference between stations 1.6 km apart.

Similar relations were found between the zooplankton and the tide in May and August even though there were significant differences in the composition of the zooplankton community during the two periods. Correlation coefficients between all species in all samples showed the presence of a diurnally migrating predator community and a nonmigrating prey community consisting of copepods. An experiment using sample data suggested that to obtain a reasonably accurate estimate of the mean numbers of a given species, at least two vertical tows should be made on a station at a 6-h interval. (Sims-ISWS)
W75-07179

AN APPLICATION OF THE METHOD OF CHARACTERISTICS TO TIDAL CALCULATIONS IN (X-Y-T) SPACE,
University of Strathcylde, Glasgow (Scotland). Dept. of Civil Engineering.
J. M. Townson.
Journal of Hydraulic Research, Vol 12, No 4, p 499-523, 1974. 14 fig, 29 ref.

Descriptors: *Estuaries, *Circulation, *Tides, *Analytical techniques, *Fluid mechanics, Model studies, Density currents, Boundary processes, Coriolis force, Dispersion, Computers, Equations, Numerical analysis, Waves(Water), Currents(Water).
Identifiers: *Method of characteristics, Bicharacteristics.

In (x-y-t) space, the characteristic surfaces were defined by two so-called bicharacteristics obtained from the eigenvalues of the coefficient matrix of the long wave equations presented. The method of characteristics was shown as a basic tool in the (x-y-t) tidal situation. The method deals with all variables at the same point and, thus, represents some advantage over staggered grid methods. Results obtained by applying the method to a relatively coarse representation of an estuary were in broad agreement with measurements taken from a physical model. However, numerical models of the long wave equations along may not reproduce such effects as circulations in hydraulic models. An explicit version of the convective diffusion equation was coupled with the long wave system and certain features of float movement were reproduced by the action of the convective terms alone. The method of characteristics was suggested as a convenient framework for the manipulation of data on estuary processes. (Singh-ISWS)
W75-07182

EVALUATION OF THE CAUSES OF LEVEE EROSION IN THE SACRAMENTO-SAN JOAQUN DELTA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W75-07210

TIDAL DISCHARGE ASYMMETRY IN A SALT MARSH DRAINAGE SYSTEM,
Virginia Inst. of Marine Science, Gloucester Point.
J. D. Boon, III.
Limnology and Oceanography, Vol 20, No 1, p 71-80, January 1975. 7 fig, 1 tab, 21 ref.

Descriptors: *Tidal waters, *Tidal streams, *Tidal marshes, Discharge(Water), *Virginia, Currents(Water), Channel flow, Suspended solids, Hydraulics, Marshes, Salt marshes, Drainage systems, On-site investigations, Measurement, Model studies.
Identifiers: *Tidal cycles, Current speed, Wachapreague(Va), Little Fool Creek(Va).

Tidal discharge and area-averaged current speed were measured over complete tidal cycles at the entrance to a salt marsh drainage system near Wachapreague, Virginia. A pronounced asymmetry in curves of discharge and current speed through time was observed which can be simulated by a model incorporating semidiurnal tides and 'overtides' in conjunction with marsh and channel storage relationships. As a persistent feature in marsh channel flow relationships, the asymmetry, along with an apparent difference in flood and ebb maxima, may have a systematic, long-term influence on the net transport of suspended matter entering and leaving natural marshes. (Lee-ISWS)
W75-07244

AN AUTOMATED TECHNIQUE FOR TOTAL DISSOLVED FREE AMINO ACIDS IN SEAWATER,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5A.
W75-07247

A COMPARISON OF VERTICAL DRIFT-ENVELOPES TO CONVENTIONAL DRIFT-BOTTLES,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
E. C. Monahan, B. J. Higgins, and G. T. Kaye.
Limnology and Oceanography, Vol 20, No 1, p 141-147, January 1975. 3 fig, 2 tab, 10 ref.

Descriptors: *Currents(Water), *Drift bottles, *Water circulation, Ocean currents, Oceanography, Drifting(Aquatic), Winds, Seiches, On-site investigations, Laboratory tests, *Massachusetts.
Identifiers: *Vertical drift-envelopes, Nantucket Sound(Mass), Cape Cod(Mass).

A comparison of the recovery sites of vertical drift-envelopes and of ballasted drift-bottles released simultaneously at common locations in Nantucket Sound off Cape Cod substantiates a preliminary conclusion, based on small tank experiments and simple calculations, that vertical envelopes move more rapidly through the water due to direct wind influence than do ballasted bottles. The bottles therefore provide a truer indication of surface currents than do the envelopes. (Jess-ISWS)
W75-07248

SEASONAL VARIATION OF THE ALONGSHORE VELOCITY FIELD OVER THE CONTINENTAL SHELF OFF OREGON,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
A. Huyer, R. D. Pillsbury, and R. L. Smith.
Limnology and Oceanography, Vol 20, No 1, p 90-95, January 1975. 8 fig, 17 ref. NSF Grants GX-28746, GX-33502.

Descriptors: *Ocean currents, *Currents(Water), *Coasts, Water circulation, *Continental shelf, Rip currents, Oceanography, *Oregon, Seasonal, Velocity.

The seasonal variation in the alongshore velocity field was inferred from direct current observations made over the Oregon continental shelf at various locations and irregular intervals since 1965. Monthly mean currents were computed and compared with earlier studies to give a description of the seasonal variation in the alongshore currents. In winter, the alongshore flow is generally northward and independent of depth. In spring, flow is southward at all depths but stronger near the surface. In summer, surface flow is southward and deep flow is northward; the southward surface flow forms a coastal jet and the deep northward velocity increases with distance offshore. (Jess-ISWS)
W75-07249

A COMPARISON OF OBSERVED AND NUMERICALLY SIMULATED CIRCULATION IN THE CAYMAN SEA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
R. L. Molinari.
Journal of Physical Oceanography, Vol 5, No 1, p 51-62, January 1975. 17 fig, 13 ref. NSF Grant GA-20569; IDOE Grant AG-253.

Descriptors: *Circulation, *Currents(Water), *Oceans, Anticyclones, Eddies, Numerical analysis, Model studies, On-site investigations, Topography, Advection, Friction, Flow.
Identifiers: *Cayman Sea, *Yucatan Current.

An observational and numerical study of the circulation in the Cayman Sea was presented. Data taken in three different years suggested a common February to May circulation pattern. A well-developed current crosses 85W south of the Cayman Ridge. An anticylonic eddy in the central basin appeared to be a common feature of this season's circulation. The data from these cruises consistently portrayed significant accelerations occurring in the vicinity of Cozumel Island where the flow merges with the Yucatan Current. A different pattern was inferred from data collected in July and August. The north component of the flow over the western edge of the Cayman Ridge appeared to determine the type of flow regime observed. The numerical model was based on predictive equations for the vorticities in a two-layer ocean on a beta-plane, and included topographic, advective, and friction effects. The model was driven by lateral input boundary conditions derived from an April-May 1968 observational study. The baroclinic western boundary current of the numerical model developed in response to eastern input boundary conditions, while the barotropic current was constrained to intensify and flow along the continental slopes. (Roberts-ISWS)
W75-07250

COASTAL MORPHOLOGY,
Louisiana State Univ., Baton Rouge.
H. J. Walker.
Soil Science, Vol 119, No 1, p 3-19, January 1975. 4 fig, 40 ref.

Descriptors: *Seashores, *Geomorphology, *Coasts, *Tidal effects, *Beach erosion, Lagoons, Estuaries, Deltas, Dunes, Reefs, Coral, Ocean waves, Barriers, Oceans, Ocean currents.
Identifiers: *Coastal morphology, Coastal processes, Cliffs, Coastal forms, Subaerial processes, Subaqueous processes.

The coast, i.e., the zone where land, sea, and atmosphere meet, is one of earth's most varied and variable environments. Its tectonic and climatic history have produced a configuration which is being altered by physical, chemical, and biological processes. Because these processes operate at different intensities in various parts of the world, the degree of alteration varies greatly. Coastal processes cause both erosion and deposition but the overall effect is a tendency toward smoothing out the coastline. Some of the most common forms along coasts of today are cliffs, beaches, lagoons, estuaries, deltas, dunes, and reefs. Many of these are ephemeral and are present today mainly because coatal processes are operating at a level only recently reached by a rising sea. Even though stillstand has prevailed only 3000-5000 years, there already has been a major reduction in the size and variety of many of these forms and also a major reduction in the quantity of sand available for the nourishment of the world's beaches and coastal dunes. As long as stillstand continues, variety in coastal forms is destined to be reduced even more. (Lee-ISWS)
W75-07270

TYPE 16 FLOOD INSURANCE STUDY: TSUNAMI PREDICTIONS FOR PACIFIC COASTAL COMMUNITIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 6F.
W75-07283

UNSTEADY SALINITY INSTRUSION IN ESTUARIES; PART I: ONE-DIMENSIONAL, TRANSIENT SALINITY INTRUSION WITH VARYING FRESHWATER INFLOW; PART II: TWO-DIMENSIONAL ANALYSIS OF TIME-AVERAGED SALINITY AND VELOCITY PROFILES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
J. S. Fisher, D. R. F. Harleman, and M. L. Thatcher.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-782 804, $3.75 in paper copy, $2.25 in microfiche. Committee on Tidal Hydraulics, Corps of Engineers, US Army, Technical Bulletin No. 20, July 1974. 41 p, 14 fig, 2 tab, 12 ref. DA-22-079-CIVENG-65-20.

Descriptors: *Estuaries, *Salinity, *Saline water intrusion, Inflow, Hydraulics, Mathematical models, Hydraulic models, Model studies, Tidal water, Forecasting, Distribution patterns, Equations, Flow profiles, Unsteady flow, *Correlation analysis.
Identifiers: *Velocity distribution.

A study concerned with transient salinity intrusion is described in two parts. In Part I a one-dimensional numerical model is developed for the prediction of transient salinity intrusion under conditions of varying freshwater inflow. The model couples the one-dimensional continuity and momentum equation for unsteady tidal motion in a variable area estuary with the mass transport equation for salinity. In Part II a two-dimensional analytical model is developed for the prediction of vertical distributions of velocity and salinity, averaged over a tidal period. The results of the numerical model described in Part I are used to determine the longitudinal salinity gradient which, for partially and well-mixed estuaries, is assumed to be independent of depth. The governing equations of the two-dimensional model are the vertical and longitudinal equations of motion, the equations of continuity and salt conservation, and an equation of state relating salinity and density. Dimensionless correlations, between mean vertical mass and momentum transfer coefficients and gross estuary characteristics, based on previous experimental data are pesented. These correlations are used to predict vertical velocity and salinity profiles for the WES salinity flume for the 25 tidal cycle test with decreasing freshwater inflow. Comparisons of predicted and observed salinity and velocity profiles are given. (WES)
W75-07284

REMEDIAL PLANS FOR PREVENTION OF HARBOR SHOALING, PORT ORFORD, OREGON; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-07285

STA-POND STABILITY TESTS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-07287

A COMPARATIVE STUDY OF PRIMARY PRODUCTION AND STANDING CROPS OF PHYTOPLANKTON IN A PORTION OF THE UPPER CHESAPEAKE BAY SUBSEQUENT TO TROPICAL STORM AGNES,
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.
For primary bibliographic entry see Field 5C.
W75-07291

AUTECOLOGY OF VAGILE AND HEMISESSILE SPECIES ON PILES OVERGROWN WITH VEGETATION AND ANIMALS: MACROFAUNA. 5. MOLLUSKS,
L. Schutz.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 653, $3.25 in paper copy, $2.25 in microfiche. NOO T-22, 1974. 17 p, 51 ref. Translated from Internationale Revue der Gesamten Hydrobiologie, Vol 54, p 581-592, 1969.

Descriptors: *Benthic fauna, *Ecological distribution, *Life cycles, *Mollusks, Mussels, Salinity, Crustaceans, Brackish water, Growth rates, Diets, Reproduction.
Identifiers: *Motile species, Salinity gradient, Mytilus edulis, Congeria cochleata, Embletonis pallida.

The life cycles of many motile micro- and macroanimals show that euryhaline animals alter their life rhythm when they leave the sea and migrate into brackish water. The stronger the limnic influence, the more retarded are development and growth. The environment influences the overall regulation and coordination system of development. The extremely euryhaline mussel, Mytilus edulis, adapts its life rhythm to salinity variations. The species Congeria has representatives generally in tropic-subtropic brackish waters. Congeria cochleata appears mainly in Betamesohaline and in Alpha-oligohaline areas of the Baltic Canal. In the boreal zone, C. cochleata is relatively insensitive to waste water contamination. It attaches itself to piles, stones, and even aquatic plants, as well as to mud bottom. The opistobranchian, Embletonia pallids, appears in brackish waters in the boreal zone. The easternmost encounter was in the Baltic Sea near Helsinki, northernmost encounter was near Kalmar. The distribution, habitats, food habits, life cycles and reproduction of these mollusks are described. (Jones-Wisconsin)
W75-07296

THE SEAWEEDS OF THE MURMANSK REGION IN THE VICINITY OF THE MALYY OLENIY (NEMETSKIY) ISLAND,
For primary bibliographic entry see Field 5C.
W75-07297

EFFECT OF INTERACTIONS BETWEEN TEMPERATURE AND NITRATE SUPPLY ON THE CELL-DIVISION RATES OF TWO MARINE PHYTOFLAGELLATES,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W75-07322

INFORMATION FOR BUYERS AND OWNERS OF COASTAL PROPERTY IN NORTH CAROLINA.
North Carolina State Univ., Raleigh. Center for Marine and Coastal Studies.
For primary bibliographic entry see Field 6E.
W75-07350

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MULTICOMPONENT FIXED-BED ION-EXCHANGE: THEORY, PRACTICAL SIMPLIFICATIONS, AND PROCESS APPLICATIONS,
California Univ., Berkeley. Sea Water Conversion Lab.
G. Klein, and T. Vermeulen.
SWCL Report 74-1, July 1974. 51 p, 2 fig, 2 tab, 67 ref. OSW Grants 14-01-0001-358, 14-01-0001-737, 14-01-0001-1698.

Descriptors: *Desalination, *Desalination processes, *Ion exchange, Separation techniques, Water treatment, Sea water, Resins, Cation exchange, Anion exchange, Chemical reactions, Chemical precipitation, Theoretical analysis, Laboratory tests.
Identifiers: Deionization, Fixed-bed ion exchange, Column dynamics.

The general theory of fixed-bed separations for ion exchange and adsorption was reviewed, with emphasis on extensions contributed by this study. Findings based on the equilibrium model were discussed, as applied to single stepwise feed-composition changes. Mathematical methods for calculating composition-path grids, phase equilibria, and composition-velocity eigenvalues were reviewed and amplified for both mass-action and constant-separation-factor systems, and an improved version for complete calculation of equilibrium performance of ternary ion-exchange systems was provided. A survey was given on ion-exchange accompanied by chemical reaction -- i.e., complexing and precipitation. Also, experimental and theoretical work on column dynamics of multicomponent ion exchange was surveyed with consideration of cyclic operations. (Sims-ISWS)
W75-07045

3B. Water Yield Improvement

A CASE STUDY OF TWO STORMFURY CLOUDLINE SEEDING EVENTS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office.
R. C. Sheets, and S. C. Pearce.
NOAA Technical Memorandum ERL WMPO-21, February 1975, 55 p.

Descriptors: *Cloud seeding, *Clouds, Weather modification, Cloud physics, Atmospheric physics, Meteorology, Atmosphere, Convection, Climatology, Radar, Weather patterns, Temperature, Water vapor, Atmospheric pressure, Wind pressure.
Identifiers: *Cloudline seeding, Project STORMFURY, Cloud structure, Vertical velocities, Equivalent potential temperature, Cloud environment.

Two cloudline seeding cases were selected for study from the Project STORMFURY cloudline exercises. One case involved clouds in a rather active convective environment while the other case was more isolated. Both cases show that the seeded clouds grew more than the surrounding clouds but no unbiased control clouds were monitored. The temperature at the 550 mb level in the disturbed area were approximately 1C colder than ambient temperatures. This temperature drop is attributed to evaporative cooling in an extremely dry layer which existed at this level. No significant temperature change was noted at the 350 mb level, but at least a temporary increase in the broad scale water vapor content at this level was observed. The duration of these changes is undetermined. (NOAA)
W75-07078

PRELIMINARY RESULTS OF THE COMPARISON OF THE AMOUNT OF ARTIFICIAL PRECIPITATION AND WATER RESERVES OF SEEDED FRONTAL CLOUDS,
B. N. Leskov.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-782 066, $3.25 in paper copy, $2.25 in microfiche. FTD-HT-23-1177-74, June 26, 1974. 7 p, 1 fig, 1 tab, 7 ref. Translated from Trudy Ukrainskiy Nauchno-Iss-

ledovatel'skiy Gidrometeorologicheskiy Institut. Issledovaniya Protsessov Oblako- i Osadkoobrazovaniya, No. 106, p 37-41, 1971.

Descriptors: *Weather modification, *Artificial precipitation, *Cloud seeding, *Precipitable water, Precipitation(Atmospheric), Cloud physics, Storms, Meteorology, Rain, Clouds, Fronts(Atmospheric).
Identifiers: Frontal clouds.

For estimating the degree of washout of seeded layers by artificial precipitation, it is of interest to compare their water reserves with the amount of artificial precipitation. Analysis of the compared values showed that, in the majority of cases, they differ greatly from each other; in addition, the actual amount of artificial precipitation sometimes exceeds the total water reserves of the precipitation layers. It is impossible to consider frontal clouds as reservoirs of possible additional moisture. They are generators of natural precipitation. Upon introducing additional nuclei of precipitation particles into the cloud, the cloud continues to work as a generator causing the growth and release of artificial precipitation particles. Frontal cloud modification should lead not to a redistribution but to an absolute increase in precipitation. (Sims-ISWS)
W75-07163

CAN THE BALTIC SEA BE TURNED INTO A FRESHWATER LAKE,
For primary bibliographic entry see Field 4A.
W75-07165

EFFECTIVENESS OF CONTROLLED CONVECTION IN PRODUCING PRECIPITATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
V. P. Starr, D. A. Anati, and D. A. Salstein.
Journal of Geophysical Research, Vol 79, No 27, p 4047-4052, September 20, 1974. 2 fig, 2 tab, 9 ref, 1 append. NSF Grant GA-1310X.

Descriptors: *Convection, *Precipitation(Atmospheric), Water vapor, Mining, Thunderstorms, Entrainment, Atmosphere, Energy, Buoyancy, Condensation, Saturation, Dry seasons, Radiosondes, Computer programs, Analysis, Shafts(Excavations), Density, Stability.
Identifiers: *Controlled atmospheric convection, Aerological accelerator, Lapse rate.

The effectiveness of controlled atmospheric convection was analyzed in comparison to natural precipitation at five different locations on the globe. The aerological accelerator, a vertical tube of large height and diameter, presents a method for removal of water vapor from air by vertical convection. The question of whether a period of low precipitation is a period of favorable or unfavorable conditions for production of water by the aerological accelerator was examined. In addition, a prototype of the device was presented, namely, a deep mine shaft that produces water upon condensation in forced vertically rising air. (Jones-ISWS)
W75-07199

PREDICTING REDUCTION IN WATER LOSSES FROM OPEN CHANNELS BY PHREATOPHYTE CONTROL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer.
Water Resources Research, Vol 11, No 1, p 96-101, February 1975. 7 fig, 2 tab, 16 ref.

Descriptors: Phreatophytes, *Water loss, *Open channels, Channels, Seepage, Water tables, *Flood plains, Streams, Evapotranspiration, Groundwater, Vegetation, Evaporation.
Identifiers: *Phreatophytic control, Water savings, Step functions, Salt cedar.

A procedure was presented for calculating seepage from a stream due to uptake of groundwater by vegetation or evaporation from soil in the floodplain. The calculation required that the relation between evapotranspiration rate and water table depth be known. When these relations were available for a given floodplain before and after removal of phreatophytes, the reduction in seepage losses from the stream due to phreatophyte removal could be computed. To simplify the calculation process, the curves relating evapotranspiration rate and water table depth, which are generally sigmoid (curved in two directions), could be approximated by step functions of the same area. Potential water savings by phreatophyte control were calculated for step functions that were representative of deep-rooted vegetation, shallow rooted vegetation, and bare soil. In addition to the depth from which groundwater could be evaporated before and after phreatophyte removal, the water savings were affected by the vertical distance between the water level in the stream and the floodplain. (Roberts-ISWS)
W75-07264

THE IMPACTS OF SNOW ENHANCEMENT: TECHNOLOGY ASSESSMENT OF WINTER OROGRAPHIC SNOWPACK AUGMENTATION IN THE UPPER COLORADO RIVER BASIN.
Stanford Research Inst., Menlo Park, Calif.
University of Oklahoma Press, Norman, 1974. 624 p, 100 tab, 33 fig, 294 ref, 7 append. Compiled by L. W. Weisbecker.

Descriptors: *Colorado River Basin, *Weather modification, *Artificial precipitation, *Arid lands, *Snow management, Cloud seeding, Colorado, Arizona, Utah, California, Nevada, Water shortage, Environmental effects, Snowpacks, Water yield improvement, Legal aspects.
Identifiers: *Technology assessment.

The Winter Orographic Snowpack Augmentation program (WOSA) offers an inexpensive method of increasing the water supply in the Colorado River Basin. For a cost of $5.4 million per annum, the project will generate about 2.3 million acre feet of runoff within the Basin and 1.2 million outside it. The environmental, economic and social impacts of WOSA on the high mountain areas where it will be operated are almost uniformly negative. The impacts are of moderate intensity and can be compensated, controlled and monitored for an additional $5.0 million per year. The water produced in the mountains would be of no benefit to local residents but would be used by downstream desert states. A major problem facing WOSA is the development of law and policy to deal with the implications of this new technology; new guidelines must be formulated to deal with it. (See also W75-07334) (Bowden-Arizona)
W75-07333

SNOWPACK, CLOUD-SEEDING, AND THE COLORADO RIVER: A TECHNOLOGY ASSESSMENT OF WEATHER MODIFICATION,
Stanford Research Inst., Menlo Park, Calif.
L. W. Weisbecker.
University of Oklahoma Press, Norman, 1974. 86 p, 16 fig, append.

Descriptors: *Cloud seeding, *Snowpacks, *Colorado River Basin, *Weather modification, Snow, Mountains, Runoff, Streamflow, Water quality, Silver iodide, Environmental effects, Avalanches, Floods, Meteorology, Legal aspects, Orography.
Identifiers: Snowpack augmentation, *Technology assessment.

A technology assessment was made of winter orographic snowpack augmentation in the Colorado River Basin. The assessment consisted of: (1) a cost/effectiveness analysis based on the state-of-the-art in snowpack augmentation; (2) an assessment of improved cost/benefit ratios that might be achieved over a five-year period through improvements in the state-of-the-art of snowpack augmentation; (3) an assessment of the impact of snowpack augmentation on the economic, social, and environmental systems; (4) an assessment of public attitudes toward snowpack augmentation; (5) an assessment of the legal and jurisdictional consequences of snowpack augmentation and of potential public policies regarding its implementation; and (6) comparison of snowpack augmentation with other alternative means of alleviating water problems in the area. This book is a condensation of a 624-page technical report. (See also W75-07333) (Sims-ISWS)
W75-07334

3C. Use Of Water Of Impaired Quality

QUALITY OF PULP INDUSTRY WASTE WATERS AND THEIR USE FOR CROP IRRIGATION (IZSLEDVANE NA KACHESTVATA NA OTPAL'CHNITE VODI OT TSELULOZNATA PROMISHLENOST I IZPOLZUVANETO IM ZA NAPOYAVANE NA SELSKOSTOPANSKI KULTURI),
For primary bibliographic entry see Field 5D.
W75-06895

THE EFFECTS OF HUMIDITY AND CYTOKININ ON GROWTH AND WATER RELATIONS OF SALT-STRESSED BEAN PLANTS,
Ceara Univ., Fortaleza (Brazil). Departmente de Bioquimica y Biologia Molecula.
J. T. Prisco, and J. W. O'Leary.
Plant Soil. Vol 39, No 2, p 263-276, 1973.

Descriptors: *Plant growth, *Humidity, Salinity, Water loss.
Identifiers: Hormone balance, Benzyl adenine, Kinin, *Cytokinin.

Salinity inhibited growth of plants in both low and high humidities when compared to control plants grown under the same conditions. However, salt-treated plants grew better under high humidity when compared to salt-stressed plants grown under low humidity. Benzyl adenine (B.A.) sprays did not have any effect on growth of salt-treated plants grown in low humidity. However, when plants were grown in high humidity, B.A. either had no effect or inhibited the growth of the plants. Salinity increased leaf resistance to water vapor loss (R sub L) in both low and high humidity, and B.A. decreased R sub L of salt-treated plants in both humidities. The effects of salinity on decreasing root permeability were the same in both humidities studied, and they were not reversed by B.A. applications. The results do not support the idea that growth inhibition due to salinity is simply the result of impaired cytokinin metabolism and/or transport. Rather, the growth inhibition probably is due to the effect of salinity on the balance of hormones and could be acting at several different steps.--Copyright 1974, Biological Abstracts, Inc.
W75-07022

WASTE WATER RECLAMATION: THE STATEWIDE PICTURE,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5D.
W75-07118

HEALTH ASPECTS OF WATER REUSE,
Los Angeles County Sanitation District, Calif.
F. D. Dryden, and H. J. Ongerth.
Typescript paper presented at the 47th Annual Conference of the Water Pollution Control Federation, Denver, Colorado, October 7, 1974. 15 p, 18 ref.

Descriptors: *Water reuse, *Public health, *Water quality, *Water purification, *Hazards, *Organic wastes, Organic compounds, Reclaimed water, Pesticide toxicity, Heavy metals, Safety factors.
Identifiers: Health aspects.

The degree of health risk from reclaimed water is roughly proportional to the type and degree of human contact with the water and the adequacy and reliability of the treatment processes. The heterogeneous nature of wastewater and the wide ranges in concentrations of organic and inorganic constituents combine to make it a difficult flow stream for which to provide treatment that will reliably achieve a uniform end product. The contaminants in sewage and reclaimed water which are of health concern may be broadly classed as biological agents and chemical agents. Waterborne bacteria and parasitic disease outbreaks of epidemic proportions have been largely eliminated. Increasing attention has been given to the transmission of viral diseases through the water route. For uses of reclaimed water where ingestion is likely, control of chemical contaminants is a necessity. The chemical agents of health concern which may be present in reclaimed water include a wide variety of toxic organic and inorganic chemicals, such as heavy metals and pesticides. Four types of research be conducted: studies of the health of populations subject to percentages of wastewater in their water supplies; bioassays on a variety of wastewater types and degrees of treatment; improved procedures for the identification of organic compounds; and the construction of pilot plants. (Poertner)
W75-07129

HYDROPHYSICAL PROPERTIES, SALT RESERVES AND SOIL DESALINATION PROCESSES IN THE ATREK RECENT DELTA AREAS,
Desert Inst., Ashkhabad (USSR).
A. P. Lavrov, E. V. Larin, S. A. Sanin, and I. G. Tolstolytkin.
Probl Osvoeniya Pustyn'. 5, p 36-40, 1972.

Descriptors: Crops, Agronomic crops, *Rice, Cereal crops, Field crops, *Water requirements, *Soil-water-plant relationships, Deltas, Saline soils.
Identifiers: *USSR(Atrek Delta).

For the cultivation of agricultural crops (rice) in these areas of the USSR the following water dosages are recommended: 1100-1200 m3/ha for meadow soils, 1000-1100 for takyr-like soils and approximately 1000 m3/ha for typical solonchakes (after their improvement).--Copyright 1974, Biological Abstracts, Inc.
W75-07262

3D. Conservation In Domestic and Municipal Use

METROPOLITAN WATER SUPPLY ALLOCATION AND OPERATION,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
D. L. Hey, and R. S. Gemmell.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 260, $5.75 in paper copy, $2.25 in microfiche. University of Illinois Water Resources Center, Urbana-Champaign Research Report No 83, March 1974. 124 p, 17 fig, 14 tab, 55 ref, 2 append. OWRT B-059-ILL(1), UILU-WRC-74-0083.

Descriptors: *Water management(Applied), *Water supply, *Water distribution, *Water allocation, *Water costs, *Regional analysis, Planning, Water utilization, Water demand, Optimum development plans, Distribution systems.
Identifiers: *Geometric programming, *Regional systems, *Municipal water supply industry.

Presently allocation and distribution of water is determined by the supply and demand market, and therefore is geopolitically dictated and inefficient in balancing the supply in a multi-system region. The problem of efficient service districts for water supply systems is examined. Economic efficiency generates conditions which provide a rationale for choosing treatment and transportation facilities from a set of alternatives which will optimize utilization. The major problem is to minimize the total cost of providing a multiple plan and regional water supply system. To achieve maximum use and minimum cost, the capability of each system element must be assessed, and then optimally employed by determining the marginal costs of production and transportation. A methodology is presented for creating an objective function which incorporates production and transportation costs as well as constraints at meeting water demands and capacity limitations. Using data from the physical facilities, treatment processes and existing water supply problems of Chicago, a regional function is constructed and minimization demonstrated. (Salzman-North Carolina)
W75-06851

INSTITUTIONAL INTERACTION IN METROPOLITAN WATER RESOURCE PLANNING,
Metropolitan Council, St. Paul, Minn. Comprehensive Planning Dept.
For primary bibliographic entry see Field 6E.
W75-06939

CROSS-IMPACT SIMULATION IN WATER RESOURCE PLANNING,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6A.
W75-06940

REGIONAL IMPACT OF WATER RESOURCE INVESTMENTS IN A DEVELOPING AREA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 6A.
W75-06948

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS--PHASE III,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W75-06975

INTEGRATION OF HYDROLOGIC, ECONOMIC, ECOLOGIC, SOCIAL, AND WELL-BEING FACTORS IN PLANNING FLOOD CONTROL MEASURES FOR URBAN STREAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W75-06980

THE HANLON CREEK STUDY: AN ECOLOGICAL APPROACH TO URBAN PLANNING,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 6B.
W75-07067

WATER AND SEWERAGE DEVELOPMENT PLAN - KANSAS CITY METROPOLITAN REGION.
Metropolitan Planning Commission-Kansas City Region, Mo.
For primary bibliographic entry see Field 5D.
W75-07083

BIBLIOGRAPHY AND INDEX OF GEOLOGY AND HYDROLOGY, FRONT RANGE URBAN CORRIDOR, COLORADO,
Colorado Univ., Boulder. Dept. of Geological Sciences.
F. Chronic, and J. Chronic.
Available from Sup Doc, GPO, Washington, DC 20402, price $1.15. (paper cover) Geological Survey Bulletin 1306, 1974. 102 p, 1,810 ref.

Descriptors: *Colorado, *Bibliographies, *Water resources, *Hydrology, *Geology, Urbanization, Environment.
Identifiers: *Front Range Urban Corridor(Colo).

This bibliography describes geological and hydrological information about the Front Range Urban Corridor of Colorado. The Front Range Urban Corridor is one of the fastest growing areas in the Nation. With Denver, Colo. as its geographic, commercial, cultural, and population nucleus, the urban corridor covers about 4,500 square miles and extends north to south about 140 miles along the Front Range of the Rocky Mountains in a belt about 40 miles across. Broad open spaces still exist within this area. In fact, most of the area is rural; but urbanization is accelerating at the fringes of all major communities, and in many places whole new satellite towns are springing up within commuter distance of the larger centers. Urbanization is spreading across the piedmont and into the mountains, giving rise to environmental problems,. (Knapp-USGS)
W75-07218

3E. Conservation In Industry

A NOVEL BLEACHING PROCESS FOR REMOVAL OF COLOR AND TOXICITY FROM BLEACH PLANT EFFLUENT,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W75-06861

ENVIRONMENTAL PROTECTION AND ITS EFFECTS ON PRODUCTION CONDITIONS IN THE PULP AND PAPER INDUSTRY (UMWELTSCHUTZ UND SEINE AUSWIRKUNGEN AUF DIE PRODUKTIONSBEDINGUNGEN IN DER),
For primary bibliographic entry see Field 5D.
W75-06878

ZURN-ATTISHOLZ SYSTEM IS CHOSEN BY WAUSAU (PAPER MILLS CO.) FOR PULP MILL EFFLUENT.
For primary bibliographic entry see Field 5D.
W75-06879

THE SSVL (STIFTELSEN SKOGSINDUSTRIERNAS VATTEN OCH LUFTVARDSFORSKING) ENVIRONMENTAL CARE PROJECT (OF THE SWEDISH FOREST PRODUCTS INDUSTRY): TECHNICAL SUMMARY.
For primary bibliographic entry see Field 5D.
W75-06880

PAPER AND PAPERBOARD MANUFACTURING. (2). WATER SUPPLIES,
For primary bibliographic entry see Field 5F.
W75-06889

IN-PLANT REDUCTION OF SUSPENDED SOLIDS AT (EDDY FOREST PRODUCTS LTD.) ESPANOLA (ONTARIO),
Eddy Forest Products Ltd., Espanola (Ontario).
For primary bibliographic entry see Field 5D.
W75-06892

WATER REUSE FROM THE BLEACHERY TO THE RECOVERY SYSTEM,
For primary bibliographic entry see Field 5D.
W75-06893

BLEACH PLANT WATER REDUCTION,
For primary bibliographic entry see Field 5D.
W75-06932

FORECASTING INDUSTRIAL WATER UTILIZATION IN THE PETROLEUM REFINING SECTOR: AN OVERVIEW,
New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Dept. of Agricultural Economics.
T. H. Stevens, and R. J. Kalter.
Water Resources Bulletin, Vol 11, No 1, p 155-163, February 1975. 3 tab, 22 ref.

Descriptors: *Forecasting, *Industrial water, *Water utilization, *Water demand, Water resources, *Management, *Oil industry, Demand, Supply, Legislation, Technology, Prices, Energy, Alternative planning, Simulation analysis, Impact, Effluents, Control, Standards, Mathematical models, Systems analysis.
Identifiers: Petroleum refining, *Public policy, Environmental quality, Water recirculation, Petroleum consumption, Refinery location.

Petroleum refining is a major water using industry. At a time when the nation is evaluating energy policy alternatives, attention should be devoted to the relation between these alternatives and water resources management issues. Various factors which affect the utilization of and demand for water in the petroleum refining industry are: water price, environmental quality legislation, and technological elements. Each factor is related to relevant public policy issues. A general overview is presented of the principal water resources management policy issues which must be considered in any analysis of future water utilization; moreover, several empirical estimates of the potential impact of policy alternatives are given. The relationship of the above factors to the degree of water recirculation is presented. Next, alternative petroleum consumption forecasts and refinery location scenarios are developed. A parametric model of fossil fuel markets is utilized. The model is a market simulation framework which is used to forecast the demand and supply of oil, natural gas, and coal. A series of alternative water utilization forecasts for the domestic petroleum refining sector are developed and compared to those presented by others. In general, results obtained from the parametric model fall in the low end of the range of results from other forecasts. (Bell-Cornell)
W75-06944

REGIONAL IMPACT OF WATER RESOURCE INVESTMENTS IN A DEVELOPING AREA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 6A.
W75-06948

POWER SHORTAGE CONTINGENCY PROGRAM FOR THE PACIFIC NORTHWEST, LEGISLATIVE, REGULATORY AND INSTITUTIONAL ASPECTS,
Kell, Alterman, Runstein and Thomas, Portland, Oreg.
For primary bibliographic entry see Field 6E.
W75-06977

WATER USE AND COAL DEVELOPMENT IN EASTERN MONTANA: WATER AVAILABILITY, WATER DEMANDS AND ECONOMIC IMPACTS,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6D.
W75-06978

WATER USE AND COAL DEVELOPMENT IN EASTERN MONTANA: WATER AVAILABILITY AND DEMANDS,
Montana State Univ., Bozeman. Dept. of Economics and Agricultural Economics.
For primary bibliographic entry see Field 6D.
W75-06979

EFFECT OF MINING OPERATIONS ON GROUNDWATER LEVELS IN THE NEW LEAD BELT MISSOURI,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 4B.
W75-06986

PROCEEDINGS OF THE WORKSHOP ON RESEARCH NEEDS RELATED TO WATER FOR ENERGY.
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 6D.
W75-07089

COAL CONVERSION: PROCESSES, RESOURCE REQUIREMENTS, AND ENVIRONMENTAL IMPACT.
Illinois Univ., Urbana. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6D.
W75-07090

WATER REQUIREMENTS FOR A SYNTHETIC FUELS INDUSTRY BASED ON COAL,
Office of Coal Research, Washington, D.C.
For primary bibliographic entry see Field 6D.
W75-07091

LEGAL ASPECTS OF WATER FOR COAL GASIFICATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W75-07092

RESEARCH NEEDS RELATED TO HYDROLOGIC ASPECTS OF WATER FOR ENERGY FROM LARGE ENERGY COMPLEXES,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6D.
W75-07093

RESEARCH NEEDS ON ECONOMIC AND RESOURCE MANAGEMENT ASPECTS FOR COAL GASIFICATION/LIQUEFACTION,
Tennessee Univ., Knoxville. Appalachian Resources Project.
For primary bibliographic entry see Field 6B.
W75-07097

HYDROLOGY AND GEOLOGY OF DEEP SANDSTONE AQUIFERS OF PENNSYLVANIAN AGE IN PART OF THE WESTERN COAL FIELD REGION, KENTUCKY,
Geological Survey, Louisville, Ky.
For primary bibliographic entry see Field 2F.
W75-07228

INDUSTRIAL WATER DEMAND FORECASTING,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
For primary bibliographic entry see Field 6D.
W75-07346

3F. Conservation In Agriculture

RESEARCH ON CROP ROTATIONS, FERTILIZATION AND IRRIGATION IN VENETO: III. YIELDS OF ANNUAL BIENNAL AND 6-YR ROTATIONS; 1964-1969, (IN ITALIAN),
Padua Univ. (Italy). Istituto di Agronomia Generale e Coltivazioni Erbacee ed Arboree.
L. Giardini.
Riv Agron. Vol 6, No 2, p 89-103. 1972.

Descriptors: *Crops, *Plant growth, Planting management, *Fertilizers, Rainfall intensity, Irrigation, Alfalfa, Maize, Wheat, Ryegrass, Beets, Europe.
Identifiers: *Italy(Veneto), *Crop rotations.

Three types of rotations were carried out in dry and irrigated conditions (6-year rotation: autumn-spring herbage crops followed by maize, beet, autumn-spring herbage crops followed by maize, wheat and a catch crop of forage maize, alfalfa, alfalfa; biennal: autumn-spring herbage crops and maize, wheat and catch crop of forage maize; annual rotation: Italian ryegrass and maize). In each rotation 3 levels of fertilization were tested: manure, manure plus mineral fertilizer (60 kg/ha of N/crop except for alfalfa + 60 kg/ha of P2O5/yr + 75 kg/ha of K2O/yr), manure plus double mineral fertilizer. The rainfall conditions affected the data on irrigation effects. Mineral fertilization was efficient even in the presence of heavy manuring. The strong responsiveness of the Italian ryegrass-maize rotation contrasted with the results of the 6-yr rotation. The preceding crops influenced the yields of the successive crops, especially in relation to manuring. The heavily fertilized Italian ryegrass-maize rotation showed best results with respect to the average annual dry matter yields and to the nutritive values per unit area.--Copyright 1973, Biological Abstracts, Inc.
W75-06899

WATER MANAGEMENT IN CHINA, TOP PRIORITY FOR 2500 YEARS,
Northern Illinois Univ., De Kalb. Dept. of Geography.
C. J. Loeser.
Water Resources Bulletin, Vol 9, No 1, p 145-154, February 1973. 2 fig, 8 ref.

Descriptors: *Water management(Applied), *Water resources development, *River systems, *History, *Projects, Irrigation, Flood control, Agriculture, Hydrology, Dams, Lakes, Streams, Regional analysis.
Identifiers: *China, Geography, Water plans, Drainage basins.

The civilization of China has evolved as a result of interplay between irrigated regions in the higher reaches and flood prone lower basins of two major rivers, the Hwand and the Yangtze. The importance of the problems of water control has remained central throughout the history of China. Discussed are exceptional circumstances in the physical geography of China which are responsible for the dependence of Chinese civilization on man's capacity to control the behavior of water. Early projects are described which involved men who, as hydrological engineers, became and remain culture heroes to hundreds of millions of Chinese. Modern projects are described which promise to fulfill the most ancient ambitions in the organization of these river systems. Primary considerations include irrigation and flood control. Discussed also are river and canal transport. (Bell-Cornell)
W75-06942

THE RELATION OF TEMPERATURE AND LEAF WETNESS TO THE DEVELOPMENT OF LEAF BLIGHT OF WHEAT,
Indian Agricultural Research Inst., New Delhi. Div. of Mycology and Plant Pathology.
A. S. Prabhu, and Ved Prakash.

Plant Dis Rep. Vol 57, No 12, p 1000-1004, 1973, Illus.

Descriptors: *Wheat, Temperature, *Blights, *Plant diseases, Plant pathology, Pathogenic fungi, Humid climates.
Identifiers: Alternaria-triticina.

Infection and further development of leaf blight fungus, Alternaria triticina, were related to temperature and relative humidity data from sheltered hygrothermographs at the 1-ft level in wheat plots inoculated with A. triticina at different dates. Parallel inoculations on 81-day-old plants in pots were conducted to identify temperature requirements for infection at a given duration and number of wet periods. Leaf wetness greater than or equal to 10 h for 4 consecutive days following inoculation with coincident average temperature minima 50-54F were associated with moderate to high blight intensities. A day was favorable if there were greater than or equal to 10 h of leaf wetness with coincident temperature minima greater than or equal to 50F. Disease incidence and intensity were related to the frequency of favorable infection days. The average minimum temperature and the number of favorable infection days determined the infection rate.--Copyright 1974, Biological Abstracts, Inc.
W75-06943

A DYNAMIC MODEL FOR WATER AND RELATED LAND RESOURCE PLANNING,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W75-06958

EFFECT OF WATER REGIME ON SOME PHYSIOLOGICAL PROCESSES AND PRODUCTIVITY OF COTTON, (IN RUSSIAN),
Tashkent Agricultural Inst. (USSR).
A. R. Rakhimov.
Fiziol Biokhim Kul't Rast. Vol 5, No 3, p 313-317, 1973, English summary.

Descriptors: *Cotton, Agronomic crops, Crops, Field crops, *Water requirements, *Plant growth, Productivity, Crop production, *Plant physiology, Available water, Water supply, Bound water.
Identifiers: Gossypium-barbadense, Gossypium-hirsutum, Free water.

With varying degrees of water supply a ratio of free to bound water changes in the early maturing varieties (C-3210, C-3506) of Gossypium hirsutum L.: with optimal humidity (80% of soil total moisture capacity) the ratio may be in favor of free water. The value of its activity is significant. In the late maturing fine-fibered varieties (2850, C-6002) of G. barbadense L. under severe conditions of water-supply (40% of soil total moisture capacity) the ratio is in favor of bound water. Due to water bound osmotically, the factors of tension (osmotic pressure, suction power, etc) may be higher than in the standard variety 108 phi and in the control (60% of soil total moisture capacity). The same regularity is observed in cotton productivity.--Copyright 1974, Biological Abstracts, Inc.
W75-06976

INCREASING WATER USE EFFICIENCY THROUGH IMPROVED ORFICE DESIGN AND OPERATIONAL PROCEDURES FOR SUB-IRRIGATION SYSTEMS,
Texas A and M Univ., College Station. Water Resources Inst. Office of Water Research and Technology.
O. C. Wilke, and E. A. Hiler.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 344. $3.75 paper copy, $2.25 microfiche. Technical Report No 63, February, 1975. 37 p, 1 tab, 10 fig, 12 ref, append. OWRT B-080-TEX (5) 14-31-0001-3338.

Descriptors: *Irrigation efficiencies, *Mathematical models, *Subsurface irrigation, Orifices, Design, *Water utilization, Operations.
Identifiers: *Drip irrigation.

Two mathematical models describing one-dimensional flow from buried sources and in unsaturated soils were developed. One considered the consumption of water by roots. For the assumed distribution of the root consumption with time and depth, the 10-cm (4-in.) deep source provided better water distribution than did 20- and 30-cm (8- and 12-in.) deep sources. Irrigation from zero depth, as in the case of trickle irrigation, appeared to be the best system for the given conditions. Plugging of emitters by particulate materials decreased as the cross-sectional area of the emitter opening was increased. Less than 0.06 atm (1 psig) vacuum had little effect on the flow of emitters tested. Higher vacuum amounts caused the reopening of plugged orifice emitters, but caused plugging of labyrinth emitters. Vacuum-induced plugging of labyrinth emitters resulted from accumulation of silt and fine sand within the flow path. Operation at higher pressures caused limited flow recovery. A theory was proposed for determining pressure distributions in drip laterals where water is uniformly distributed along the lateral's length. The theory provided acceptable design in two tests. Computer-derived design curves were developed. Because 1000 or more emitters may be required for subirrigation of each acre, emitters need to be both inexpensive and resistant to plugging. Four experimental emitters were designed and constructed. A modification of one microtube emitter is being produced commercially. Two moveable drip systems were proposed. Drip irrigation lines successfully trailed a center-pivot irrigation system. Also a tractor-irrigation lines successfully trailed a center-pivot irrigation system. Also a tractor-mounted impement was developed for moving individual drip irrigation laterals.
W75-06991

MODELING AND ANALYSIS OF FLOODS THROUGH FLOOD PLAINS,
California State Univ., Sacramento. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07009

EFFECTS OF ROOT MEDIUM AND WATERING ON TRANSPIRATION, GROWTH AND DEVELOPMENT OF GLASSHOUSE CROPS: III. EFFECT OF WATERING-FACTOR AND VOLUME OF ROOT MEDIUM ON YIELD AND QUALITY OF GREENHOUSE TOMATOES,
State Experiment Station Landvik, Grimstad (Norway).
For primary bibliographic entry see Field 2D.
W75-07053

EFFECTS OF IRRIGATION DEVELOPMENT ON TRADE PATTERNS AND INCOME GENERATION,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W75-07104

EFFECT OF ROOT MEDIUM AND WATERING ON TRANSPIRATION, GROWTH AND DEVELOPMENT OF GLASSHOUSE CROPS: II. THE RELATIONSHIP BETWEEN EVAPORATION PAN MEASUREMENTS AND TRANSPIRATION IN GLASSHOUSE CROPS,
State Experiment Station Landvik, Grimstad (Norway).
For primary bibliographic entry see Field 2D.
W75-07153

RAINFALL-INDUCED RUNOFF COMPUTED FOR FALLOW FIELDS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 2A.
W75-07261

NOTE ON THE EFFECT OF DIFFERENT WATER REGIMES ON GROWTH AND YIELD OF THREE VARIETIES OF RICE (ORYZA SATIVA L.),
Jawaharlal Nehru Agricultural Univ., Jabalpur (India). Dept. of Soil Science and Agricultural Chemistry.
S. M. Gorantiwar, and I. K. Jaggi.
Indian J Agric Sci, Vol 42, No 9, p 866-867, 1972. Illus.

Descriptors: *Rice, *Plant growth, Moisture stress, Moisture tension, Aquatic soils, *Water requirements.
Identifiers: Oryza-Sativa.

The 3 cultivars were 'IR 8,' 'Padma' and 'Jaya' and the 5 levels of moisture were 700, 300 and 0 cm (height) of water tension, and 4 cm and 7 cm of standing water. Tensiometer readings were recorded daily, and water was added to the pots to maintain a required tension of 300 plus or minus 50 and 700 plus or minus 50 cm of water column throughout the experimental period. The treatments of 300 and 700 cm water tension resulted in a reduction in the number of effective tillers per plant, panicle development, number of fertile grains and weight of individual grains. Plants grown on continuously submerged soil were larger, tillered more profusely and yield more. 'Jaya' responded to flooding to a greater extent. High grain yields in the submergence treatments may be attributed to an increase in the availability of P and N to the plant. But the high soil-moisture stress in the treatment of 300 and 700 cm of water adversely affected the yield.--Copyright 1974, Biological Abstracts, Inc.
W75-07263

PRODUCTIVITY INCREASE OF AGRICULTURAL ECOSYSTEMS OF DANUBIAN LOWLANDS BY DAMMING AND BY DRAINAGE, (IN FRENCH),
Academia de Stiinte Agricole si Silvice, Bucharest (Rumania).
N. Petrescu.
Bull Acad Sci Agric For. 1 p, 71-83. 1972 Illus.

Descriptors: Crops, Plant growth, *Ecosystems, Agriculture, *Productivity, *Irrigation practices, River Basins, Europe, Control systems, Regulated flow, Drainage, Controlled Drainage, Drainage practices, River basins, Europe.
Identifiers: *Romania(Danube River Basin), Damming, Lowlands.

Crop analysis demonstrates the higher productivity of ecosystems in the Danubian basin than those of adjacent lowland zones. Certain technical measures must be instituted to maximize the potential yield of these ecosystems. Irrigation prevents crop yield fluctuations due to drought. The maximal, average, and minimal crop yield of corn in an irrigated culture was 8249, 5907, and 2342 kg/ha respectively as against 4832, 3348, and 1475 kg/ha for non-irrigated cultures.--Copyright (c) 1974, Biological Abstracts, Inc.
W75-07279

NUTRITIVE VALUE OF OATS AND SUDAN GRASS GROWN AT CONTROLLED TEMPERATURES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
R. W. Downes, K. R. Christian, and M. Freer.
Australian Journal of Agricultural Research, Vol 25, No 1, p 89-97, January 1974. 1 fig, 3 tab, 44 ref.

Descriptors: *Plant growth, *Photosynthesis, *Water utilization, *Forage grasses, *Oats, Temperature control, Crop production, Nutrients, Temperate, Tropical regions, Digestion.
Identifiers: *Sudan grass.

Fodder oats and Sudan grass were grown in pots in glasshouses with day/night temperatures of 27/22 and 21/16C. Plants were harvested at the emergence of each leaf and at various stages after anthesis. Growth rates and changes in dry matter content, nitrogen cellulose and in vitro digestibility in oats were similar under both temperature regimes, but more primary leaf and less panicle were formed at the high temperatures. Sudan grass development was much more rapid at the high temperatures, but production of dry matter was consistently lower than at the low temperatures. Sudan grass produced much more dry matter than oats. Differences in composition were small, but stem digestibility remained higher in Sudan grass after anthesis. Because of their efficiency of photosynthesis and water use, tropical species warrant further study of their nutritive value as forage crops. (Mastic-Arizona)
W75-07330

AN INPUT-OUTPUT MODEL OF THE LOWER RIO GRANDE REGION OF TEXAS,
Pan American Univ., Edinburg, Tex. School of Business Administration.
For primary bibliographic entry see Field 6A.
W75-07348

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

METROPOLITAN WATER SUPPLY ALLOCATION AND OPERATION,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W75-06851

ECONOMIC CRITERIA FOR FRESHWATER WETLAND POLICY IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6B.
W75-06896

PUERTO RICO WATER RESOURCES PLANNING MODEL PROGRAM DESCRIPTION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-06934

A SUMMARY VIEW OF WATER SUPPLY AND DEMAND IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 6D.
W75-06935

MEAN ANNUAL RUNOFF IN THE SAN FRANCISCO BAY REGION, CALIFORNIA, 1931-70,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-06936

WATER MANAGEMENT IN CHINA, TOP PRIORITY FOR 2500 YEARS,
Northern Illinois Univ., De Kalb. Dept. of Geography.
For primary bibliographic entry see Field 3F.
W75-06942

FACTOR ANALYSIS OF SHORELINE PHYSIOGRAPHY AND PERCEPTION OF WATER LEVEL DRAWDOWN BY RESERVOIR SHORELINE RESIDENTS,
Toronto Univ. (Ontario). Faculty of Forestry.
R. Jaakson.
Water Resources Research, Vol 9, No 1, p 81-92, February 1973. 3 fig, 3 tab, 12 ref.

Descriptors: *Water level fluctuations, *Reservoirs, *Recreation, *Lakes, *Drawdown, Analytical techniques, Storage capacity, Evaluation, Beaches, Slopes, Variability, Data collections, Summer, Planning, Mathematical models, Systems analysis, *Canada.
Identifiers: Factor analysis, Shoreline physiography, Trent Canal(Ontario), Perceptions, Shoreline residents, Visitation, Enjoyment, Interviews, Dimension models.

Factor analysis is used to examine the relationship between variations in shoreline physiography and perception of water level fluctuation by reservoir recreation users. Three elements of perception are studied: frequency of objection to water level fluctuation; frequency with which users feel that recreation enjoyment is reduced by water level fluctuation; and, as an element that may reflect perception, user days of recreation. A test of the relation between factors and water level fluctuation is made by correlating factor scores with storage capacity on 11 reservoirs and three control lakes. Five factors are identified and evaluated in terms of their significance to recreation. The factor analysis consists of a modified principal component techniques, with orthogonal Varimax rotation. From the Ontario Recreation Land Inventory data, five physical shoreline variables have been used: (1) wet beach slope; (2) wet beach material; (3) wet beach cliff height; (4) backshore slope; and (5) backshore material. In considering the above elements of perception, water level fluctuation refers to water drawdown and dropping water levels during the summer recreation season. Considered as a descriptive model of existing conditions on lakes, the shoreline physiography dimensions may be used in planning new reservoirs or as a guide for an overview of existing reservoirs. (Bell-Cornell)
W75-06945

A PROGRAMING MODEL FOR THE DESIGN OF MULTIRESERVOIR FLOOD CONTROL SYSTEMS,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
J. S. Windsor.
Water Resources Research, Vol 11, No 1, p 30-36, February 1975. 4 fig, 9 ref.

Descriptors: *River basin development, *Reservoirs, *Project planning, *Flood control, Design, *Linear programming, Optimization, Hydrographs, Decision making, Methodology, Variability, Storage capacity, Flood routing, Reservoir releases, Spillways, Constraints, Equations, Mathematical models, Systems analysis.
Identifiers: Mixed integer programming, Cost minimization, Multireservoir systems, Damage centers, Mass balance.

A methodology is presented for determining the optimal size, number, and location of flood control reservoirs in a river basin development. The flood control system may involve one or more potential damage centers. The method of solution employed is mixed integer programming, a modified form of linear programming. At this level of optimization, it is assumed that the nonlinear cost functions for the reservoirs and damage centers are known and may be approximated by a set of piecewise linear segments. Temporal and spatial flood variability at all significant points within the drainage basin is accounted for by using a representative range of recorded or synthetically derived flood hydrographs, along with the probable maximum flood, as input data to the model. Each potential flood combination is routed in turn through the proposed river basin development by using a decision policy that automatically minimizes the expected total costs of the system and at the same time provides a reasonably high degree of assurance against hydraulic failure. The inclusion of probable maximum flood input data ensures that floods are controlled even under the most adverse conditions. This approach offers a potentially powerful method in the analysis of integrated systems where a large number of interdependent variables are involved. (Bell-Cornell)
W75-06951

WATER MANAGEMENT--A GENERAL REPORT,
Illinois State Water Survey, Urbana.
W. C. Ackermann.
Hydrological Sciences Bulletin, Vol 19, No 1, p 119-130, March 1974 (From: International Symposium on the Hydrology of Lakes, Helsinki, Finland, July 1973). 10 ref.

Descriptors: *Water management(Applied), *Lakes, *Hydrology, *Model studies, Data collections, Remote sensing, Numerical analysis, Water balance, Temperature, Ice, Water quality, Simulation, Thermal pollution, Erosion, Sedimentation, Eutrophication, Great Lakes, Dissolved oxygen, Bacteria, Fisheries, Ecology, Food chains, Systems analysis.
Identifiers: Lake restoration, Chemical effects, Heat discharge.

Water management of both natural and man-made lakes is the most advanced step of the scientific-engineering processes relating to these bodies of water. Programs of observation and analyses of how these complex lake systems operate would enable management to optimize the lake's behavior so as to gain multiple benefits. In managing lakes, one must consider the on-site and off-site purposes to be served, all characteristics of the water body, and the upstream and downstream effects. This report is a product of a July 1973 lake symposium focusing on the hydrological-hydraulic elements of geophysics. A state-of-the-art paper, it summarizes the major developments which have occurred in lake studies since the Garda symposium in 1966. The emphasis at that time was on hydrological measurements and balances directed at understanding and proper design, but with only a slight attention given to management aspects. Understanding is enhanced today, but all the questions at the time of Garda are still important. Described are the areas in which principal advances have been made over the past seven years in the ability to manage lakes: (1) The International Field Year for the Great Lakes; (2) use of remote sensing as a tool for management; (3) the progress and status of numerical modelling for understanding, identification of data gaps, and for management; and (4) lake restoration as a deliberate attempt to reverse the processes of lake degradation. (Bell-Cornell)
W75-06953

INTEGRATION OF HYDROLOGIC, ECONOMIC, ECOLOGIC, SOCIAL, AND WELL-BEING FACTORS IN PLANNING FLOOD CONTROL MEASURES FOR URBAN STREAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W75-06980

EFFECT OF DIVERTING MISSISSIPPI RIVER WATER TO TEXAS ON SEDIMENTATION IN THE RIVER,
Louisiana Water Resources Research Inst., Baton Rouge.

For primary bibliographic entry see Field 2J.
W75-06983

OWNERSHIP AND USE RIGHTS IN WATER WITHIN NORTH DAKOTA,
North Dakota Univ., Grand Forks. School of Law.
For primary bibliographic entry see Field 6E.
W75-06995

MODELING AND ANALYSIS OF FLOODS THROUGH FLOOD PLAINS,
California State Univ., Sacramento. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07009

MODEL SIMULATION OF THE DOWNSTREAM EFFECTS OF OPERATING THE SIRIKIT POWER STATION,
Electricity Generating Authority of Thailand, Nonthaburi. Planning Dept.
For primary bibliographic entry see Field 8B.
W75-07015

ANALOG, DIGITAL AND HYBRID SIMULATION OF WATER LEVEL DISTRIBUTION IN OCCURRENCES OF FLOODS IN A SYSTEM RIVER FLOOD PLAIN,
Technische Universitaet, Hanover (West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
For primary bibliographic entry see Field 2E.
W75-07018

DESIGNING BY OBJECTIVES, A SIMULATION STUDY ON THE RIVER YOM IN NORTHERN THAILAND,
MacDonald (Murdoch) and Partners, London (England).
R. F. Stoner, and J. B. Downs.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 239-250, (1973). 2 fig, 4 tab, 4 ref.

Descriptors: *Model studies, *River basin development, *Planning, Floods, Forecasting, Flood discharge, Peak discharge, Flood recurrence interval, Flood stages, Flooding, River flow, Evaporation, Hydrologic aspects, Rainfall, Runoff, Flood plains, Agriculture, Irrigation, Flood protection, Analysis.
Identifiers: *Thailand(River Yom).

The simulation model used when planning the development of the River Yom Basin was discussed. The main objective of the Yom Basin study was to provide a plan for the overall development of the basin's water resources and it was divided into three parts to examine: (1) the irrigation potential and make recommendations for likely cropping patterns, cultivation intensities, and area to be developed; (2) the river flood problem and make outline proposals for flood alleviation measures; and (3) the hydro-electric potential of the basin. The simulation model used inputs for river flow, rainfall, and evaporation which actually occurred in a single year, and was run for each year on record. Outputs related to meeting study objectives were analyzed on a probability basis. Tabulated results of the simulation study showed that the development plan for flood control will substantially reduce dam peak discharges and area flooded for return periods from 2 to 10 years. (See also W75-06998) (Humphreys-ISWS)
W75-07019

MATHEMATICAL MODEL OF MEKONG RIVER NEAR VIENTIANE AND NONGKHAI,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
For primary bibliographic entry see Field 2E.
W75-07023

MODELING RIVER AND ESTUARY UNSTEADY FLOW SYSTEMS,
Utah State Univ., Logan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07024

FLOOD ROUTING FOR URBAN RIVER NETWORK,
Osaka Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07027

THE PASSAGE OF A FLOOD WAVE THROUGH A JUNCTION,
Sri Lanka Univ., Peradeniya. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07028

A MATHEMATICAL MODEL TO PREDICT DISCHARGE VARIATIONS IN AN ESTUARY WITH SHALLOW WATER AND A LARGE TIDAL RANGE,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).
For primary bibliographic entry see Field 2L.
W75-07035

GENERAL REPORTS, DISCUSSIONS, LECTURES, VOLUME 4.
For primary bibliographic entry see Field 2J.
W75-07038

STABILIZATION OF COASTAL DREDGE SPOIL WITH SPARTINA ALTERNIFLORA,
North Carolina State Univ., Raleigh. Dept. of Botany; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W75-07071

FLOOD PLAIN INFORMATION: AGUA HEDIONDA CREEK, PACIFIC OCEAN TO BUENA, SAN DIEGO COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
Prepared for San Diego County, July, 1973. 24 p, 11 fig, 6 tab, 16 plates.

Descriptors: *Floods, *Flood data, *Flooding, *Flood damage, Flow, Historic floods, Maximum Probable Flood, Flood water, Flood recurrence interval, Flood frequency, *California, Runoff, Velocity.
Identifiers: *San Diego County(Calif), Agua Hedionda Creek(Calif), Buena Creek(Calif), Carlsbad(Calif), Intermediate Regional Flood, Standard Project Flood.

The drainage area of Agua Hedionda Creek and its tributary, Buena Creek, covers 29 square miles from Buena to the Pacific Ocean. A very broad flood plain runs from El Camino Real to Agua Hedionda Lagoon which provides considerable flood storage during large floods. Development is largely agricultural or undeveloped; only 5% of the 700 acres in the flood plain are developed as ranches with a mobile park and golf course upstream from El Camino Real. Agua Hedionda Lagoon at the Pacific Ocean has been improved as a water sports area. Because of steep banks, residences flanking the shores are outside the flood plain. The City of Carlsbad projects that the highly developed area just outside the Lagoon flood plain will continue to grow rapidly. Storms critical for the watershed produce high peak flows of short duration and relatively small volumes. Snow is not an important runoff factor. Several reaches of improved channel and construction of a concrete weir act as flood damage reduction measures. Major floods occurred since 1862 on an irregular basis. Future floods expected from severe local storms are projected as the Intermediate Regional Flood (IRF) with peak flows of 10,500 cubic feet/second (cfs) and 15,000 cfs for a Standard Project Flood (SPF) at the Lagoon entrance with lesser discharges upstream. Flood velocities reaching 8 feet/second (fps) on the overbank for an IRF upstream from El Camino Real would create substantial damage and erosion. Residential damage would be small since most development is outside the flood plain. Severe erosion can occur in steep canyon areas with possible velocities of 22 fps. (Park-North Carolina)
W75-07087

FLOOD HAZARD ANALYSIS: FOUR MILE AND EIGHT MILE CREEKS, BUTLER COUNTY, KANSAS.
Soil Conservation Service, Salina, Kans.
Prepared for Butler County Planning Commission, November, 1974. 42 p, 11 plates, 6 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood profile, *Flood data, Flood damage, Flood plain zoning, Flood discharge, Flood flow, Maximum probable flood, *Kansas.
Identifiers: Four Mile Creek(Kansas), Eight Mile Creek(Kansas), Butler County(Kansas), Wichita(Kansas), Intermediate Regional Flood, 500-year flood.

Drainage patterns and runoff in the Four Mile and Eight Mile Creek areas east of Wichita are changing as increasing population and housing density impinge upon the agricultural lands. Urbanization is expected to increase from the present 13% to 32% for Four Mile Creek watershed (73.43 sq. mi.), and from 5% to 14% for the Eight Mile Creek watershed (34.82 sq. mi.), based upon present growth patterns. High intensity spring and summer thunderstorms cause small floods several times a year with larger floods occurring at irregular yearly intervals. Mean annual precipitation is 30 inches; annual mean runoff approximately 5 inches. An adequate and dependable water supply necessary for major development is lacking in the study area. The major flood of record in April 1944 caused damage to crops, livestock, machinery, railroads, roads and bridges. Flood discharges and elevations for projected 10-year, 25-year, 50-year, 100-year, and 500-year frequency floods for 30 points along Four Mile Creek and for 35 stations along Eight Mile Creek are given. A flood plain management program based on the data supplied is suggested as an alternative to control by dams as encroachments have preempted available sites and by channel work which would require substantial financing. Local flood plain regulations and ordinances must be approved by the Chief Engineer, Kansas Division of Water Resources, prior to building. Minimum standards prohibit human habitation unless adequately protected within the flood plain zone based on the 100-year frequency flood and require suitable flood proofing of new construction to an elevation level approved by the chief engineer. Other important factors to be considered for efficient flood plain management are suggested. (Park-North Carolina)
W75-07088

STUDY OF TRACE ELEMENTS IN WATERS OF TWO ALASKAN RESERVOIR SITES,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W75-07100

SUMMARY OF THE BAYLANDS SALT WATER FLOOD CONTROL PLANNING STUDY.
Tudor Engineering Co., San Francisco, Calif.

Santa Clara County Flood Control and Water District, San Jose, California, January 1973. 26 p, 11 fig.

Descriptors: *Saline water-freshwater interfaces, *Diversion structures, *Flood protection, *Planning, *Bays, Levees, Saline water barriers, Alternative planning, California, Check structures, Dikes, Flood control.
Identifiers: Santa Clara County(California), San Francisco Bay, Baylands.

The basic flood problems presently handled by the Santa Clara County Flood Control and Water district are caused by fresh water flowing in the major streams of the County from near their headwaters to their outfalls into San Francisco Bay. In July, 1971 the District initiated a study of the problems of salt water flooding along the Bay front and in the Baylands area of the County. The purpose of the study was to develop information that will assist in a determination of whether the Flood Control and Water District should expand its responsibilities to include protection of the Baylands from salt water flooding and how this may be accomplished. Flooding has become a problem of increasing concern because intensive utility, military, industrial and residential activities have located in portions of the low-lying Baylands. The existing levees in the Baylands were constructed primarily to enclose the salt ponds. They are of mixed earthwork construction. Three basic alternative plans were analyzed. The first plan is a 'do-nothing' alternative. The second alternative is the Inboard Levee Plan. This would consist of perimeter levees utilizing in part the existing alignment of the inboard system. The third alternative is the Outboard Levee Plan, utilizing for the most part the alignment of the existing outboard levee system on the Bay side of the salt ponds and on the channels. Design factors, construction costs, assessed values, tax cost, and comparative costs are given for all alternatives. (Poertner)
W75-07136

AN OVERVIEW OF URBAN HYDROLOGY AND RUNOFF MANAGEMENT,
H. G. Poertner.
In: Proceedings, National Symposium on Urban Rainfall and Runoff and Sediment Control, University of Kentucky, Lexington, July 29-31, 1974. p 25-31.

Descriptors: *Urban hydrology, *Urban runoff, *Administration, *Flood control, *Institutional constraints, *Cities, Storm drains, Flood plains, Flood plain zoning, Water policy, Planning, Drainage engineering, Urbanization, Regional development, Management.
Identifiers: *Runoff control, Stormwater management.

One alternative to the present unsatisfactory state of runoff control and flood plain management is to establish a modern program of management responsive to all segments of the population. Major limitations of present practices in engineering and design are: deficiencies in knowledge of urban hydrology, lack of analyses of accumulated data, and ineffective use of data for producing optimum designs of integrated drainage systems. Problems of urban drainage are primarily institutional. Enabling legislation is needed for management of water on a watershed basis, in entire metropolitan areas, by a single authority. A regional entity can produce a more uniform approach to the solution of water problems and replace present piece-meal and ineffective procedures with coordinated and competent planning, engineering, construction, and management. Action programs should be developed on federal, state and local levels to improve drainage systems and correct deficiencies within existing flood plains. This would be beneficial to existing communities as well as those that may emerge in the surrounding areas. Such programs should be flexible and should be integrated. Research in both management and engineering now demands full-time attention. (Poertner)
W75-07141

DEVELOPMENT OF A COMPUTER PROGRAM TO ROUTE RUNOFF IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWERS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5D.
W75-07143

REAL-TIME ESTIMATION OF RUNOFF IN THE MINNEAPOLIS-ST. PAUL METROPOLITAN AREA,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5G.
W75-07144

THE REAL-TIME COMPUTATION OF RUNOFF AND STORM FLOW IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWERS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5G.
W75-07145

1973 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,
Oregon State Water Resources Board, Salem.
For primary bibliographic entry see Field 7C.
W75-07150

CAN THE BALTIC SEA BE TURNED INTO A FRESHWATER LAKE,
A. Meclewski.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-779 006, $3.25 in paper copy, $2.25 in microfiche. NRL Translation 1291, April 26, 1974. 5 p. Translated from Poseidon (East German publication), No 3, p 104-107, 1973.

Descriptors: *Oceans, *Sea water, *Dikes, Salinity, Saline water, Freshwater, Fishing, Climatology, Oceanography, Evaporation, Runoff, Hydraulic structures, Hydrology.
Identifiers: *Baltic Sea.

An interview with Stanislaw Hueckel, Director of the Institute of Hydroengineering of the Polish Academy of Sciences in Gdansk was presented. Professor Hueckel explained that he was not the originator of the proposal to turn the Baltic into a freshwater lake, but rather that he only wanted to call attention to a concept which had been developed earlier. If the sporadic penetration of salt water from the North Sea can be prevented, the Baltic could be converted into a freshwater sea within 25 years. Greater quantities of potable fresh water could then be obtained. Technical difficulties would not be greater than in the diking of the Zuyder Zee in Holland. All the Baltic countries could begin the study of the problem on the basis of a joint agreement. (Sims-ISWS)
W75-07165

IMPACT ANALYSIS: HINDSIGHT AND FORESIGHT IN SASKATCHEWAN,
Saskatchewan Fisheries Lab., Saskatoon.
For primary bibliographic entry see Field 6G.
W75-07171

HYDROELECTRIC DEVELOPMENT OF THE NELSON RIVER SYSTEM IN NORTHERN MANITOBA,
Manitoba Hydro, Winnipeg.
For primary bibliographic entry see Field 6G.
W75-07172

ENVIRONMENTAL IMPACT OF THE CHURCHILL FALLS (LABRADOR) HYDROELECTRIC PROJECT: A PRELIMINARY ASSESSMENT,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 6G.
W75-07173

ASSESSMENT OF THE IMPACT OF HYDRO-DAMS,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
For primary bibliographic entry see Field 6G.
W75-07178

FLASH FLOOD POTENTIAL FROM CHANNEL MEASUREMENTS,
Geological Survey, Reston, Va.
H. C. Riggs.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No 112, p 52-56, 1974. 4 fig, 6 ref.

Descriptors: *Flash floods, *Channel morphology, *Alluvial channels, Peak discharge, Flow characteristics, Streamflow, Design flood, Measurement.

Discharge measurements of flash floods add to hydrological knowledge and provide information needed for protection from future floods. But planning for protection cannot be postponed until a serious flood has occurred at each site. Thus method of estimating flood potential at ungaged sites are needed. A promising method utilizes (1) a relation between a flood characteristic and stream channel size based on data at gaging stations, and (2) channel size measurements at ungaged sites at which flood characteristics are to be estimated. The method is described and demonstrated using data on ephemeral and perennial streams. The flood characteristics used are the 10-year or the 50-year floods. Channel size is represented by the top width of a cross section; the top of the cross section is variously defined by channel bars, by breaks in bank slope, or by the lower limit of permanent vegetation. In semiarid regions this method produces better results than regression of basin characteristics. Floods of higher recurrence intervals can be approximated as a multiple of the 10-year flood. (Knapp-USGS)
W75-07203

A METHOD FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN SOUTH DAKOTA,
Geological Survey, Huron, S. Dak.
L. D. Becker.
Available from NTIS, Springfield, Va 22161 as PB-239 831/As, $4.75 in paper copy, $2.25 in microfiche. Water-Resources Investigations 35-74, August 1974. 78 p, 23 fig, 4 tab, 15 ref.

Descriptors: *Floods, *South Dakota, *Flood frequency, Flood recurrence interval, Rainfall-runoff relationships, Flood forecasting, Peak discharge, Flood data.

A general flood-frequency analysis provides a method for estimating flood magnitudes and frequencies in South Dakota. The State is divided into two hydrologic regions. For each region, the 2-, 5-, 10-, 25-, 50-, and 100-year floods are related to basin and climatic characteristics by regression equations. Indices based on contributing drainage area size, elevation, and mean annual precipitation are the most useful variables. Relationships based on these variables can be used to estimate floods of selected frequency at most ungaged sites where peak flows are not significantly affected by regulation or other manmade works. Equations and graphs are applicable to drainage basins with areas approximately from 0.1 sq mi to 4,000 sq mi in the Eastern Region and from 0.1 sq mi to 9,000 sq mi in the Western Region. Flood characteristics are

tabulated for 130 gaging stations. Maximum flood peaks determined at 188 gaging stations and 52 miscellaneous sites are compared with regional flood relationships. (Knapp-USGS)
W75-07211

A HYDROLOGIC ASSESSMENT OF THE SEPTEMBER 14, 1974, FLOOD IN ELDORADO CANYON, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 2E.
W75-07214

INDEX OF FLOOD MAPS FOR CALIFORNIA PREPARED BY THE U.S. GEOLOGICAL SURVEY THROUGH 1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-07216

FLOODS OF SEPTEMBER-OCTOBER 1967 IN SOUTH TEXAS AND NORTHEASTERN MEXICO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W75-07219

SURFACE WATER FEATURES OF FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-07221

INDEX OF SURFACE WATER STATIONS IN TEXAS, OCTOBER 1974.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-07224

FLOOD MAPPING IN CHARLOTTE AND MECKLENBURG COUNTY, NORTH CAROLINA,
Geological Survey, Charlotte, N.C.
W. G. Stamper.
Open-file report, 1974. 21 p, 5 fig, 1 tab, 7 ref.

Descriptors: *Floods, *Maps, *North Carolina, Flood profiles, Flood data, Stage-discharge relations, Backwater, Flood plain zoning, Maximum probable flood, Design flood, Mapping.
Identifiers: *Flood maps, *Charlotte(NC), *Mecklenburg, County(NC).

Development on the flood plains of streams in Charlotte and Mecklenburg County, North Carolina has created a serious flood hazard. A flood map series is being compiled to include 286 miles of streams in the city and county. Impervious cover, drainage area, channel length, and channel slope were computed for each drainage basin to determine the 100-year flood discharge. The cross-sections for 286 miles of streams at approximately 500-foot intervals were obtained from aerial photographs using photogrammetric methods. The hydraulic geometry of over 200 bridges and culverts was measured. The Manning roughness coefficients were picked at selected locations in the field and then interpolated using aerial photographs. The 100-year flood elevations were computed using the step-backwater method. The computed floodway district encroachment lines and floodway fringe boundaries are presented on a series of topographic maps with insets showing a tabulation of the data. (Knapp-USGS)
W75-07230

STREAMFLOW CHARACTERISTICS IN NORTHEASTERN UTAH AND ADJACENT AREAS,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 7C.
W75-07232

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1975 FISCAL YEAR,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 7C.
W75-07233

MAP SHOWING DRAINAGE AREAS, MIDDLETOWN QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-07239

ESTIMATES OF TEMPERATURE AND PRECIPITATION FOR NORTHEASTERN UTAH,
Geological Survey, Salt Lake City, Utah.
F. K. Fields, and D. B. Adams.
Available from Sup. of Documents, GPO, Washington, D.C. 20402, $3.15 single copy. Journal of Research of the US Geological Survey, Vol 3, No 2, p 131-136, March-April 1975. 7 fig, 3 ref.

Descriptors: *Temperature, *Precipitation(Atmospheric), *Utah, Estimating, Forecasting, Computer programs, Data processing, Statistical methods, Regression analysis, Data collections.

Estimates of temperature and precipitation were made for northeastern Utah from information that was collected at 67 locations. The variable-length records were converted to the common-time base of 1941-70; then general relations were developed to extend the converted point values to unsampled sites. Regression techniques were used to fill voids in the temperature-data base. Incomplete precipitation records were adjusted to the 1941-70 average on the assumption that the ratio of concurrent data is directly proportional to the ratio of the respective 1941-70 average annual values at nearby sites. Equations were developed in a computer program to express the relationship of temperature and precipitation with altitude and location and to extend the information to unsampled sites. Two-thirds of the observed and estimated average annual temperature and precipitation values are within plus or minus 1.5 deg F and 2.08 in., respectively, of the calculated averages. Schematic diagrams, plotted by computer, were prepared to show variations of altitude, temperature, and precipitation; and maps, also plotted by computer, show lines of equal altitude, precipitation, and temperature. (Knapp-USGS)
W75-07241

RAINFALL-INDUCED RUNOFF COMPUTED FOR FALLOW FIELDS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 2A.
W75-07261

PREDICTING REDUCTION IN WATER LOSSES FROM OPEN CHANNELS BY PHREATOPHYTE CONTROL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W75-07264

KONA DAM VS. KONATOWN: A SOCIOLOGICAL INTERPRETATION OF SELECTED IMPACTS OF RESERVOIR DEVELOPMENT ON A COMMUNITY FIELD,
East Texas State Univ., Commerce. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W75-07271

CAPACITY EXPANSION MODEL OF WATER RESOURCE FACILITIES FOR A MAJOR RIVER SYSTEM,
Texas Univ. at Austin. Coll. of Engineering.
For primary bibliographic entry see Field 6A.
W75-07277

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: HYDRAULICS OF SURFACE WATER RUNOFF,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2A.
W75-07278

COMPUTER-CALCULATED GEOMETRIC CHARACTERISTICS OF MIDDLE-MISSISSIPPI RIVER SIDE CHANNELS; VOLUME 1: PROCEDURES AND RESULTS; VOLUME 2: SIDE CHANNEL CONTOUR MAPS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
S. J. Winfrey, and V. E. LaGarde.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report M-74-5, June 1974. Vol 1: 110 p, 19 tab, 18 pl, 4 ref. Vol 2: 23 p, 1 tab, 1 fig, 24 map.

Descriptors: *River basins, *Open channels, Ecology, Streams, *Mississippi River Basin, *Computer models, Computer programs, Maps, Contours, Topographic mapping, Hydraulics, Model studies.
Identifiers: *Hydraulic geometry, Middle Mississippi River, *Side channels(Mississippi River).

Several geometric characteristics of water-basin regimes, including basin size and shape, area underwater at specific water depth, and cross-sectional area, are commonly associated with benthic, plankton, and fish community population structures, although little quantitative data are available to support the association. This two-volume report describes a general procedure that was developed to calculate values of selected parameters used to define the above-mentioned geometric characteristics of any water-basin regime. The procedure was successfully applied to yield quantitative information for those parameters for 18 side channels of the Middle Mississippi River. Which of the parameters selected as quantitative descriptors of the characteristics are best indicators of animal community population structures is expected to be determined as a result of other projects currently under way at the U.S. Army Engineer Waterways Experiment Station. Volume I contains a description of the procedure and the results of implementing it. Volume II contains a set of computer-plotted contour maps for the 18 side channels. (WES)
W75-07282

GILA RIVER BASIN, NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA: ALTERNATIVE PLANS FOR FLOOD CONTROL AND RECREATIONAL DEVELOPMENT.
Army Engineer District, Los Angeles, Calif.
April, 1974. 57 p, 2 tab, maps.

Descriptors: *Arizona, *Floodwater, Engineering structures, Floodplain zoning, *Cost-benefit ratio, Historic floods, Bypasses, Diversion structures, Canals, Flood recurrence interval, Recreation, Recreation facilities, *Flood control, *Alternative planning.
Identifiers: *Gila River Basin(Ariz), Phoenix(Ariz).

An assessment is made of feasible alternatives for providing flood control in the Phoenix area. The study area, slightly over 2600 square miles, has had increasing flood problems because urban growth has placed housing on the floodplains. Since this growth is expected to continue, flood problems can be expected to worsen. Also, ur-

banization, by paving the land surface, increases runoff. Five alternative actions are presented to alleviate the danger of flooding. Environmental and social considerations have entered into the plans. With the exception of the alternative to take no action, all proposed plans have some unavoidable consequences for riparian vegetation and archeaological sites. All proposed actions have favorable benefit-to-cost ratios. (Bowden-Arizona)
W75-07331

REPORT ON WATER SUPPLY, FORT HUACHUCA AND VICINITY, ARIZONA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4B.
W75-07332

THE CALIFORNIA STATE WATER PROJECT IN 1970.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6B.
W75-07347

AN INPUT-OUTPUT MODEL OF THE LOWER RIO GRANDE REGION OF TEXAS,
Pan American Univ., Edinburg, Tex. School of Business Administration.
For primary bibliographic entry see Field 6A.
W75-07348

4B. Groundwater Management

A SURROGATE-PARAMETER APPROACH TO MODELING GROUNDWATER BASINS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-06960

EFFECT OF MINING OPERATIONS ON GROUNDWATER LEVELS IN THE NEW LEAD BELT MISSOURI,
Missouri Univ., Rolla. Dept. of Geological Engineering.
D. L. Warner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 343, $4.75 in paper copy, $2.25 in microfiche. Completion Report, December 1974. 85 p, 13 fig, 3 tab, 28 ref. OWRT A-060-MO(2). 14-31-0001-3825-4025.

Descriptors: *Missouri, Mining, Dewatering, Pumping, Groundwater, *Water levels, *Aquifers, Lead, *Mine water.
Identifiers: *New Lead Belt(Mo), *Lead mining, *Mine dewatering, *Groundwater levels.

Lead deposits of the Viburnum Trend or New Lead Belt of southeast Missouri were discovered in the 1950's. The district has since become the world's largest lead producer. The mining area is in a narrow north-south band about 50 miles long. There are presently eight operating underground mines. Ore deposits are in the Cambrian age Bonneterre Formation, a carbonate unit about 275 feet thick. The Bonneterre and the underlying Lamotte Formation comprise the deep groundwater aquifer of the area and are overlain by the Davis Formation, a shale aquitard. Formations above the Davis comprise an unconfined aquifer. In order to work the underground mines of the New Lead Belt, it is necessary to dewater the Bonneterre Formation. This requires pumpage of several hundred to several thousand gpm, depending on the mine location. The effect of this pumping on groundwater levels was evaluated. The study showed that it is probable that mine pumping does not affect groundwater levels in the deep aquifer beyond a distance of about five miles from any of the mines. Major areas of influence are still more restricted. As mining continues, the area influenced will extend further from north to south, but will probably not expand much east-west. The little information available indicates that no general decline in water levels in the shallow unconfined aquifer has resulted. It appears that the Davis Formation is an effective aquitard and only where it is fractured is interaquifer leakage likely to be rapid enough to cause a major decline in the water table of the shallow aquifer.
W75-06986

INCREASING WATER USE EFFICIENCY THROUGH IMPROVED ORFICE DESIGN AND OPERATIONAL PROCEDURES FOR SUB-IRRIGATION SYSTEMS,
Texas A and M Univ., College Station. Water Resources Inst. Office of Water Research and Technology.
For primary bibliographic entry see Field 3F.
W75-06991

SEDIMENTOLOGY OF AQUIFERS OF THE TONGUE RIVER FORMATION, NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
A. F. Jacob.
Research Report No. WI-221-023-74, November, 1974, 4 p, 3 ref. OWRT A-033-NDak (1).

Descriptors: *Groundwater, Aquifers, *Sedimentology, Lignite, *North Dakota, *Sand aquifers, Mapping, Distribution, Forecasting.
Identifiers: *Lignite aquifers, *Tongue River Formation(NDak).

Much groundwater is taken from aquifers in Tertiary sediments and sedimentary rock in the Williston Basin area of North Dakota. These aquifers occur in the Tongue River Formation and are of two types: sand bodies and lignite beds. The most important sand aquifers are linear sand and sandstone bodies up to about 1,000 feet wide, 60 feet thick and many miles long. The sand was deposited in streams that flowed eastward from the ancient Rocky Mountains into the Williston Basin area during the Paleocene Epoch. Lignite aquifers occur in areas adjacent to the sand bodies. They are beds that are laterally extensive and usually not greater than about 20 feet thick. They formed from organic matter that originated in swamps adjacent to the main streams. Fine-grained sediment (silt and clay) surrounds the sand and lignite aquifers. In some places where the Tongue River Formation is present at the earth's surface, erosion has exposed the sand bodies as buttes. Here the sand bodies can be mapped on air photos to determine the pattern of the depositing streams. This pattern can be projected into areas where the Tongue River Formation is buried, enabling the prediction of the location of at least some sand and lignite aquifers in the subsurface.
W75-06993

GROUNDWATER OF SOUTHEASTERN VIRGINIA.
Virginia State Water Control Board, Richmond. Bureau of Water Control Management.
Planning Bulletin 261-A, August 1974. 33 p, 13 fig, 1 tab, 10 ref.

Descriptors: *Groundwater, *Aquifers, *Hydrogeology, *Virginia, Groundwater resources, Groundwater recharge, Dewatering, Water table, Water levels, Groundwater movement, Water quality, Pollutants, Chlorides, Water level fluctuations, Withdrawal, Artesian heads, Pumping, Drawdown, Computer models, Subsurface waters, Water supply.
Identifiers: Water level declines.

From 1941 to 1974, large industrial withdrawals of groundwater in the Franklin area produced a cone of depression approximately 32 km in diameter and 55 m deep. Withdrawals at Franklin and elsewhere in southeastern Virginia have raised concern over current and future development and utilization of groundwater. The southeastern Virginia study area includes all of Isle of Wight, Prince George, Southampton, and Surry counties, parts of Dinwiddie, Greensville, and Sussex Counties, and cities of Chesapeake, Emporia, Franklin, Hopewell, Norfolk, Petersburg, Portsmouth, Suffolk, and Virginia Beach. The availability of groundwater in southeastern Virginia presently is good because pumpage in the area has not been increased in recent years. The quality of groundwater in the area also is very good. However, if pumpage is increased above the present rate, groundwater levels may decline to a point below the top of the Lower Cretaceous aquifers; in this manner dewatering of the principal aquifers would begin. Increased pumpage also may cause the high chloride-water wedge(s) to move westward resulting in the contamination of freshwater wells. (Sims-ISWS)
W75-07044

GOALS, POLICIES AND MANAGEMENT OF WATER RESOURCES IN THE RIO GRANDE VALLEY (APJ-1).
Middle Rio Grande Council of Governments of New Mexico, Albuquerque; and Herkenhoff (Gordon) and Associates, Albuquerque, N. Mex.
Special Report No. 34, January, 1971. 38 p, 2 fig, 12 ref.

Descriptors: *Groundwater resources, *Groundwater recharge, Water resources, *Water supply, *Rio Grande River, Water treatment, Water table, Water table aquifers, Water rights, Water demand, Irrigation, Water, Water delivery, Wells, Water levels, Water sources, Water wells, Geology formations, Hydrologic properties, *New Mexico.
Identifiers: Rio Grande Valley(NM), *Albuquerque(NM), *Santa Fe formation(NM), Bernalillo County(NM), Valencia County(NM), Sandoval County(NM), San Juan-Chama Project(NM), Coefficient of storage.

The area involved (APJ-1) contains 1450 square miles in Bernalillo, Valencia, and Sandoval Counties in New Mexico. It is rapidly urbanizing around the City of Albuquerque. General goals and policies for efficient management and maintenance of the water supply are given. All municipal, industrial, and domestic water supply is presently drawn from underground sources. The San Juan-Chama project under construction (total diversion 110,000 acre-feet per year) will divert water into the Rio Grande watershed and will provide storage points for imported water. The water table elevations in the less urbanized areas should remain constant to year 2000. Near Albuquerque, the water table may recede as much as 85 feet causing the city to use its share of the San Juan-Chama diversion to recharge its groundwater supply. Geologic conditions and hydrology are described. Use in Albuquerque is presently averaging 200 gallons/capita/day with the largest loss due to irrigation (70% lost to evapotranspiration). It is recommended that the primary future water source for the area should be deep wells that produce from the Santa Fe formation. All feasible water sources, including sewage treatment plant effluent and storm runoff, should be exploited as recharge or direct uses. Well construction is not greatly dependent upon location in the study area with the favored design being the gravel wall well which provides maximum production of water from unconsolidated sands and gravels. Treatment criteria for municipal supplies, criteria for distribution storage (fire storage, equalizing storage, transfer storage) and pumping equipment problems are discussed. (Park-North Carolina)
W75-07084

ALAMITOS BARRIER PROJECT,
Los Angeles County Flood Control District, Calif.
E. Alves, Jr., and D. B. Hunt.

Report 68-69, 1969. 72 p, 24 fig, 11 tab, 1 append.

Descriptors: *Saline water intrusion, *Saline water-freshwater interfaces, *Saline water barriers, *California, *Injection, *Recharge, Groundwater barriers, Groundwater movement, Separation techniques, Flooding, Sea water, Geohydrologic units, Aquicludes.
Identifiers: *Los Angeles(California), *Alamitos barrier.

Fresh water injection and salt water extraction operations in the Alamitos Barrier Project during the 1968-69 fiscal year were relatively trouble free and marked by successful maintenance activities. The majority of the redevelopments took place near the central and easterly portions of the barrier in an effort to increase injection where the greatest difficulty in achieving protective elevations in the I zone was experienced. As pointed out in the 1967-68 report, the trapped saline wedge continued to migrate slowly inland, being gradually dissipated as it mixed with fresher water. Analysis of groundwater data indicates that the highest groundwater elevations occurred during December, 1968. The record rainfall in January and February reduced inland pumping requirements and injection rates were correspondingly reduced, reaching a minimum in February which was held with slight change through June. Changes in water quality during the year are illustrated by Fall, 1968 and Spring, 1969 isochlor maps. There were major changes in the configuration of the recent aquifer isochlors. Supplemental chlorination of the barrier ceased July 6, 1967. Shock chlorination was used during 1967-68; however, it was not used during 1968-69. A record 5530 acre-feet of fresh water was injected at a total cost of $53.11/AF (not including amortization of capital expenditures) of which $24.00/AF was the price of water. In addition, 1823.8 acre-feet of saline water was extracted from the recent aquifer at a cost of $27.78/AF. (Poertner)
W75-07131

A PROGRAM FOR WATER RECLAMATION AND GROUNDWATER RECHARGE, ENVIRONMENTAL IMPACT STATEMENT.
Jenks and Adamson, Palo Alto, Calif.
Santa Clara County Flood Control and Water District, San Jose, California, April 1973. 26 p, 5 fig, 3 tab, 3 append.

Descriptors: *Water reuse, *Water conservation, *Environmental effects, *Groundwater, *Recharge, *Saline water intrusion, Monitoring, Artificial recharge, Environmental control, Injection wells, Pollution, California, Water quality control.
Identifiers: Santa Clara County(California), Waste water reclamation, Environmental Impact Statements.

A water reclamation plant is to be located at the existing Palo Alto Subregional Water Quality Control Plant, together with a ground water well injection and monitoring system. The results of an environmental impact study are reported. The project will not in any significant way alter the existing terrestrial environment. However, the project will impact to a significant extent both the ground water and surface water environment in the affected area. The primary purpose of the proposed project is to prevent further salt water intrusion to the underground water resource supply. In addition, the project will reduce pollution to the receiving waters of San Francisco Bay. Thus, the significant impact of the project will be positive both in respect to quality and quantity of the natural water resource. The adverse effects from the plant will be noise and air pollution. The project was adopted for implementation after consideration and evaluation of five basic alternatives to meet the water supply needs of the affected area. Two alternatives involve importation of water. One alternative involves desalination of San Francisco Bay water, and the remaining two alternatives involve use of reclaimed wastewater to either (1) percolate into the ground water basin, or (2) inject into the ground water basin. (Poertner)
W75-07137

GEOTHERMAL DRILLING IN KLAMATH FALLS, OREGON,
Storey (E. E.) Well Drilling, Klamath Falls, Oreg.
For primary bibliographic entry see Field 8B.
W75-07146

OPTIMUM DEVELOPMENT OF GROUND WATER FROM THE COASTAL AQUIFERS OF DELAWARE; WHERE, HOW MUCH, AND FOR HOW LONG CAN WE SAFELY PUMP OUR COASTAL AQUIFERS,
Delaware Univ., Newark. Water Resources Center.
R. D. Varrin, and A. Salam.
Transactions of the Delaware Academy of Science-1970 and 1971, p 63-76, 1973. 10 fig. OWRT A-004-DEL(6).

Descriptors: *Groundwater, *Saline water intrusion, *Drawdown, *Aquifers, Coasts, *Delaware, Pumping, Aquifer management, Freshwater, Saline water, Interfaces, Saline water-freshwater interfaces, Subsurface waters, Wells, Water levels.

Overdevelopment of the groundwater in coastal areas causes salt water from the sea to intrude into the freshwater aquifers, thus polluting it. Any change in the water table causes the boundary or interface between the fresh and salt water to move. If the water table is lowered, the salt tongue may move several thousand feet inland. Using a model, the position of the freshwater/salt water interface before and after it is affected by man can be studied. The principal activity that affects the freshwater/salt water balance is pumping. Pumping lowers the groundwater table and causes the salt water to move inland. An optimum scheme of location was developed and experiments were conducted to find an optimum pumping. The wells were placed at variable depths in such a way that they were equi-distant from the interface profile. Under pumping at a rate of 200 gallons per minute per square mile, the water table rose to an average of 15 feet and the interface profile was pushed back about 1/2 mile seaward. (Sims-ISWS)
W75-07149

MAJOR AND HISTORICAL SPRINGS OF TEXAS,
Texas Water Development Board, Austin.
G. Brune.
Report 189, March 1975. 95 p, 58 fig, 2 tab, 76 ref.

Descriptors: *Springs, *Texas, *History, *Hydrogeology, Spring waters, Water sources, Water supply, Artesian aquifers, Artesian wells, Groundwater movement, Groundwater, Geology, Discharge(Water).

Springs have been very important to Texas from the time of its first inhabitants. Texas originally had 281 major and historically significant springs, other than saline springs. Sixty-three springs, many with important historical backgrounds, have completely failed. Of the 281 springs studied, 139 issue from 2 underground reservoirs. Although total flow of the springs discussed has declined, it still amounts to about 1,150,000 acre-feet per year, and if all the smaller springs are included, the total annual flow probably exceeds 3,000,000 acre-feet. The underground reservoirs from which springs arise may be cavernous limestone or gypsum, sand, gravel, or other permeable formations. Although a large number of water analyses were obtained and studied, no progressive trend toward contamination of spring waters could be found. The decline of spring flows probably began soon after the first colonization of Texas by Spain. Clearing of forest land and heavy grazing of pastures probably reduced recharge. In the middle 1800's, the drilling of many flowing wells greatly reduced the artesian pressure on springs. Detailed informaton was given separately for each spring, including the location, geologic setting, historical background, and discharge. (Sims-ISWS)
W75-07152

GROUND-WATER QUALITY BENEATH SOLID-WASTE DISPOSAL SITES AT ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5B.
W75-07204

INVESTIGATING GROUND-WATER POLLUTION FROM INDIANAPOLIS' LANDFILLS--THE LESSONS LEARNED,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 5B.
W75-07205

MONITORING REGIONAL EFFECTS OF HIGH PRESSURE INJECTION OF INDUSTRIAL WASTE WATER IN A LIMESTONE AQUIFER,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W75-07206

GROUND-WATER CONTAMINATION IN THE SILURIAN DOLOMITE OF DOOR COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 5B.
W75-07207

ERTS IMAGERY FOR GROUND-WATER INVESTIGATIONS,
Geological Survey, Bay Saint Louis, Miss. Gulf Coast Hydroscience Center.
For primary bibliographic entry see Field 7B.
W75-07208

SIMULATED DRAWDOWN FOR SELECTED WELL FIELDS IN THE OHIO RIVER ALLUVIAL AQUIFER,
Geological Survey, Louisville, Ky.
H. F. Grubb.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-239 163 $3.75 in paper copy, $2.25 in microfiche. Water-Resources Investigations 2-74, January 1975. 38 p, 24 fig, 1 tab, 17 ref, append.

Descriptors: *Drawdown, *Simulation analysis, *Ohio River, *Alluvial channels, Aquifers, *Kentucky, Withdrawal, Mathematical models, Surface-groundwater relationships, Well spacing.

Drawdown caused by pumping was simulated for three sites in the alluvial aquifer adjacent to the Ohio River by digital modeling. Two well-field arrangements were studied at each site. The initial well-field arrangement at each site consisted of three wells located in a line parallel to the Ohio River. The simulated wells were 350 feet apart and 500 feet from the river. Pumping was simulated at a rate of 1,500 gpm for 256 days. The second well-field arrangement allowed comparison drawdown between the initial well-field arrangement and (a) wells located 350 feet nearer the river, (b) additional wells, located between the initial well field and the bedrock valley wall and (c) wells located on a line perpendicular to the river rather than parallel to the river. A verification procedure for the digital model based on observed aquifer response to a flood on the Ohio River is included. (Knapp-USGS)
W75-07209

HYDROLOGIC- AND SALT-BALANCE INVESTIGATIONS UTILIZING DIGITAL MODELS, LOWER SAN LUIS REY RIVER AREA, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-07212

GROUND-WATER DATA, 1973, INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. L. Banta.
Open-file report, December 1974. 9 p, 4 fig, 1 tab, 3 ref.

Descriptors: *Groundwater, *California, *Water quality, *Water levels, Basic data collections, Arsenic compounds, Withdrawal, Hydrologic data.
Identifiers: *Indian Wells Valley(Calif).

Water-level measurements were made in about 110 wells in Indian Wells Valley, California in October 1973. The average water-level decline was 1.2 feet in six wells in the intermediate area between October 1972 and October 1973. This decline was 2.3 feet less than the average decline during the previous year. The average water level in the Inyokern area remains about the same between October 1972 and October 1973. The average water-level decline was 2.0 feet in four wells in the Ridgecrest area between October 1972 and October 1973. The total pumpage from Indian Wells Valley during 1973 was about 14,900 acre-feet, a decrease of about 2 percent from 1972. During 1972 five arsenic determinations ranged from 10 to 15 micrograms per litre. (Knapp-USGS)
W75-07215

GROUND-WATER WITHDRAWALS IN THE UPPER PEACE AND UPPER ALAFIA RIVER BASINS, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-07222

ANNUAL REPORT ON GROUND WATER IN ARIZONA--WITH EMPHASIS ON GILA BEND BASIN, MCMULLEN VALLEY, AND THE SOUTHEAST PART OF THE HARQUAHALA PLAINS--SPRING 1973 TO SPRING 1974.
Geological Survey, Phoenix, Ariz.
Arizona Water Commission, Phoenix, Bulletin 9, February 1975. 45 p, 16 fig.

Descriptors: *Groundwater, *Arizona, *Basic data collections, *Hydrologic data, Withdrawal, Water yield, Water supply, Water wells.

The geologic and hydrologic data necessary to evaluate the groundwater resources of Arizona, 1973-1974 are compiled. Maps show potential well production by areas, depth to water in selected wells in spring 1974, and change in well levels in selected wells from 1969 to 1974. In areas where groundwater development has taken place the potential well-production values are based on the actual measured production of existing wells. In other areas the potential well-production values are based on the extrapolation of the known production of a few wells that penetrate the several water-bearing units and on the inferred hydrologic characteristics of the units. The report also contains maps showing detailed hydrologic conditions in the Gila Bend basin, McMullen Valley, and the southeast part of the Harquahala Plains. The groundwater reservoirs furnish about two-thirds of the water used in Arizona. The largest use of water is for irrigation; however, more water is being withdrawn each year for municipal and industrial uses. For the 21st consecutive year, the withdrawal of groundwater exceeded 4 million acre-feet. In 1973 the withdrawal of groundwater was nearly 4.8 million acre-feet; through 1973, nearly 149 million acre-feet of groundwater had been withdrawn from the groundwater reservoirs in Arizona. (Knapp-USGS)
W75-07223

HYDROLOGY AND GEOLOGY OF DEEP SANDSTONE AQUIFERS OF PENNSYLVANIAN AGE IN PART OF THE WESTERN COAL FIELD REGION, KENTUCKY,
Geological Survey, Louisville, Ky.
For primary bibliographic entry see Field 2F.
W75-07228

HYDROLOGY OF THE SAND-AND-GRAVEL AQUIFER IN CENTRAL AND SOUTHERN ESCAMBIA COUNTY, FLORIDA, PRELIMINARY REPORT--NOVEMBER 1973,
Geological Survey, Tallahassee, Fla.
H. Trapp, Jr.
Open-file report FL-74027, 1975. 64 p, 11 fig, 1 tab, 15 ref.

Descriptors: *Hydrogeology, *Water resources, *Groundwater, *Florida, *Aquifer characteristics, Groundwater movement, Hydrologic data, Water levels.
Identifiers: *Pensacola(Fla), *Escambia County(Fla).

The sand-and-gravel aquifer is the only freshwater aquifer in the Pensacola area of Florida. Problems related to development of the aquifer include maximum safe yield, local contamination, local salt-water intrusion, corrosiveness of the water, areas of high iron concentration, and increasing nitrate concentration. Although the thickness of the aquifer locally exceeds 1,000 feet, most of the clean sand layers are no more than 450 feet below land surface. The highest head is at the north edge of the area; the head is drawn down below sea level in areas of heavy pumping. Groundwater moves southward from the northern half of the county to be intercepted near Cantonment. Almost all groundwater discharged south of Cantonment derives from local precipitation. The report contains maps showing concentrations of carbon dioxide, nitrate, and iron in water from the aquifer, potentiometric maps, geohydrologic sections, and lithologic and radioactive logs of test holes. (Knapp-USGS)
W75-07229

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1975 FISCAL YEAR,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 7C.
W75-07233

MAP SHOWING DEPTH TO WATER, ANCHORAGE AREA, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W75-07238

CONTOUR MAP OF THE BEDROCK SURFACE, MOUNT HOLYOKE QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-07240

DELINEATION OF BURIED GLACIAL-DRIFT AQUIFERS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2F.
W75-07242

GEOLOGIC SETTING AND CHEMICAL CHARACTERISTICS OF HOT SPRINGS IN WEST-CENTRAL ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2F.
W75-07243

REPORT ON WATER SUPPLY, FORT HUACHUCA AND VICINITY, ARIZONA.
Army Engineer District, Los Angeles, Calif.
March 29, 1974. 2 vols.

Descriptors: *Watershed management, *Water resources, *Water sources, *Groundwater, *Water supply development, *Arizona, Water levels, Aquifers.
Identifiers: Fort Huachuca(Ariz), San Pedro River(Ariz).

Adequate groundwater is available in the upper San Pedro River basin to support present and foreseeable future growth at Fort Huachuca and in surrounding areas. Production wells can be located in the East Range of Fort Huachuca. The capital costs of modifying the existing water supply system to meet present deficiencies of the system, plus inclusion of provisions for future expansion, were estimated at $920,000 (1974 prices). The total capital cost of modifying the existing water supply system to meet present deficiencies and of expanding the Post's water supply system to meet assumed daytime Post populations of 25,000 and 50,000 are estimated at $2,330,000 and $6,180,000 respectively. An alternative supply of water could result from construction of Charleston Reservoir, as authorized under the Central Arizona Project. However, the Bureau of Reclamation has assigned a low priority to this work. (Bowden-Arizona)
W75-07332

A RELATION BETWEEN GAMMA RADIATION AND PERMEABILITY, DENVER-JULESBERG BASIN,
Shell Oil Co., Denver, Colo.
C. L. Rabe.
Journal of Petroleum Technology, February, p 65-67, 1957. 6 fig, 1 ref.

Descriptors: *Radioactivity, *Permeability, Gamma radiation, Clay, Radioactive well logging, Clay minerals, Adsorption, Cements, Marking techniques, *Colorado, *Sandstones.
Identifiers: Dakota Sandstone, Muddy Sandstone, Bentonite marker beds.

A relation does exist between permeability and gamma radiation for clay-bonded Muddy and Dakota sands of the Denver-Julesberg Basin, Colorado. In order to apply this relation, gamma ray surveys must be adjusted to a common scale, and proper correction made for thin bed effects. The relation is limited to clay-bonded sands, as calcareous or siliceous cementing materials, which are sometimes encountered and reduce permeability, would not be expected to increase gamma radiation above the clay-free line. Therefore, examination of cores or cuttings is necessary. For the best results where thin beds are involved, the logging speed and time constant should be so chosen that the 'drag' has a value of about 1 foot. Interpretation can also be improved if statistical variation is recorded at a high and low level of radiation and at a chart speed comparable to that of the logging speed. (Bradbeer-NWWA)
W75-07335

4C. Effects On Water Of Man's Non-Water Activities

CATION CONCENTRATIONS OF SMALL STREAMS DRAINING MATCHED FORESTED AND CLEARCUT WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula. School of Forestry.
G. T. Foggin, III, and L. K. Forcier.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 309, $4.25 in paper copy, $2.25 in microfiche. Research Report No 58, Montana University Joint Water Resources Research Center, Bozeman, December

1974. 54 p, 5 fig, 12 tab, 54 ref. OWRT A-069-MONT(1).

Descriptors: *Forest management, *Watersheds(Basins), *Land use, *Clearcutting, *Water quality, *Sediment control, *Cations, *Montana, Watershed management, *Small watersheds, Forest watersheds, Land management, Conductance, Water chemistry.

The effects of land management practices on stream water quality in western Montana are not well known. To adress this issue, 15 small clearcut basins were randomly chosen within 50 km of Missoula and their morphometric characteristics determined. Based on this analysis, 15 forested watersheds were selected that were morphometrically similar to the clearcut basins. During the spring and summer of 1974, stream water samples were collected and analyzed for (Ca++), (Mg++), (Na+), (K+) and specific conductance. In basins thought to be on non-calcareous bedrock, specific conductance was quite low compared to that of watersheds assumed to be underlain by calcareous material. The relative concentrations of the four cations were not the same between these two groups of watersheds. Clearcut basins generally had greater stream flow than forested areas. Despite this potential for dilution, average nutrient concentrations on the clearcut basins indicate a greater dissolved nutrient release from the clearcuts. The magnitude of the increase between clearcut and forested basins is substantially less than the increase between basins on calcareous and non-calcareous parent material. Vegetative recovery following forest disturbance was expected to affect stream chemistry. The average time sine clearcutting in the random sample, 9.3 years, may account for the deviation of the western Montana results from some published studies. However, contradictory trends are noted when comparing the cationic concentrations of the two most recently logged watersheds with their forested counterparts.
W75-06853

THE HANLON CREEK STUDY: AN ECOLOGICAL APPROACH TO URBAN PLANNING,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 6B.
W75-07067

URBAN STORM RAINFALL-RUNOFF-QUALITY INSTRUMENTATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W75-07202

BIBLIOGRAPHY AND INDEX OF GEOLOGY AND HYDROLOGY, FRONT RANGE URBAN CORRIDOR, COLORADO,
Colorado Univ., Boulder. Dept. of Geological Sciences.
For primary bibliographic entry see Field 3D.
W75-07218

A MEASUREMENT OF ALBEDO CHANGES RESULTING FROM AFFORESTATION PRACTICES,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2D.
W75-07265

EFFECTS OF RESERVOIR CLEARING ON WATER QUALITY IN THE ARCTIC AND SUBARCTIC,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W75-07272

4D. Watershed Protection

CATION CONCENTRATIONS OF SMALL STREAMS DRAINING MATCHED FORESTED AND CLEARCUT WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 4C.
W75-06853

TYPES OF EROSION AND DEPOSITION OF SEDIMENTS IN LAKE ASHTABULA AND THE CONTROLLING PROCESSES,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-06996

LARGE MATERIAL MODELS IN WATERSHED HYDROLOGY RESEARCH,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2A.
W75-07004

APPLICATION OF A CATCHMENT MODEL IN SOUTHEASTERN AUSTRAILIA,
Monash Univ., Clayton (Australia). Dept. of Civol Engineering.
For primary bibliographic entry see Field 2A.
W75-07054

RAINFALL AND SNOWMELT RUNOFF FROM INTERMEDIATE ELEVATION WATERSHEDS,
For primary bibliographic entry see Field 2A.
W75-07101

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CATION CONCENTRATIONS OF SMALL STREAMS DRAINING MATCHED FORESTED AND CLEARCUT WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 4C.
W75-06853

A PRELIMINARY REVIEW OF ANALYTICAL METHODS FOR THE DETERMINATION OF SUSPENDED SOLIDS IN PAPER INDUSTRY EFFLUENTS FOR COMPLIANCE WITH EPA-NPDES PERMIT TERMS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
J. J. McKeown, H. S. Costa, and D. B. Buckley.
National Council of the Paper Industry for Air and Stream Improvement, Special Report No 75-01, 34 p, January, 1975. 3 fig, 12 tab, 8 ref, 2 appendices.

Descriptors: *Water analysis, *Pollutant identification, *Suspended solids, *Permits, *Pulp and paper industry, Effluents, Water pollution sources, Analytical techniques, Industrial wastes, Wastes, Pulp wastes, Pollutants, Waste identification, Filters, Filtration, Testing procedures, Reviews, Data collections, Inter-Agency cooperation, Governments, Discharge(Water), Regulation, Legislation.

It is shown that variation in analytical testing procedures permitted under Environmental Protection Agency-National Pollutant Discharge Elimination System regulations can account for widely varying measured suspended solids contents of pulp and paper mill effluents. As a consequence, the utility of much of the data available on suspended solids is said to be of questionable value for defining discharge permit conditions unless complete descriptions of procedures used accompany the data. Significant variations in results were found to be related to the filtering media and systems employed, volume of effluent filtered, and post-filtration washing procedure. It is recommended that the various agencies concerned collaborate to develop a uniform test procedure, and that this procedure then be applied to generate a data base on solids discharge which can be used as a reliable basis for establishing permit requirements. (Hansen-IPC)
W75-06865

RAPID MONITORING OF MILL EFFLUENT QUALITY,
T. E. Howard, C. C. Walden, and J. R. Munro.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 71-74, 2 fig, 2 tab.

Descriptors: *Water analysis, *Oxygen demand, *Pulp wastes, Effluents, Pulp and paper industry, Bioassay, *Monitoring, Biological properties, Analytical techniques, Industrial wastes, Waste water treatment, Quality control, Water quality control, Biochemical oxygen demand, Operations, Toxicity, Fish.

The 96-hour bioassay and 5-day BOD tests commonly applied to industrial effluents are useful in meeting the requirements of regulatory agencies and in evaluating long-term aspects of treatment plant performance. They are not well adapted to short-term process control, and do not contribute to immediate application of remedial measures when operating problems arise. There is a need for rapid methods to assess biological characteristics of effluent quality. Several tests are discussed which may have value for rapid monitoring of treatment plant functioning. These include continuous in situ bioassay, test of thermal tolerance in fish, residual oxygen bioassay, and measurement of oxygen uptake rates in treated effluents. The latter test is regarded as particularly promising and is discussed in some detail. This test can be completed in less than 8 hours, sufficiently short for remedial action to deal with operational problems. Preliminary data indicate that effluents with an oxygen uptake rate of less than 1 mg/liter/hr are nontoxic. Effluents with higher uptake rates are generally toxic. (Hansen-IPC)
W75-06870

THE DETERMINATION OF CHROMIUM (VI) IN NATURAL WATERS BY DIFFERENTIAL PULSE POLAROGRAPHY,
Tennessee Univ., Knoxville. Dept. of Chemistry.
Analytica Chimica Acta, Vol 75, No 1, p 199-205, March, 1975. 2 fig, 3 tab, 22 ref.

Descriptors: *Water analysis, *Chromium, *Polarographic analysis, Analytical techniques, Copper, Iron, Ammonium compounds, Trace elements, Water pollution sources, Pollutants, Chemical analysis, Metals, Inorganic compounds, *Pollutant identification.

A method utilizing differential pulse polarography for the determination of Cr(VI) in natural water is described. Additions of 0.62 microgram Cu(II)/ml and 0.55 microgram Fe(III)/ml did not interfere with the determination of 0.050 microgram Cr (VI)/ml. The natural water samples containing Cr(VI) were buffered to approximately pH 7 with 0.1 molar ammonium acetate and 0.005 molar ethylenediamine and analyzed. Natural water samples of chromium content from 0.035 microgram/ml to 2.0 microgram/ml may be analyzed directly without further preparation. The detection limit is 0.010 microgram/ml. (Witt-IPC)
W75-06874

POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND.
For primary bibliographic entry see Field 5C.
W75-06881

POLLUTION LOAD FACTORS FOR BLEACH PLANT EFFLUENTS,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y.
Tappi, Vol 58, No 2, p 134, February, 1975. 1 tab.

Descriptors: *Bleaching wastes, *Pulp wastes, *Suspended solids, *Organic loading, Water pollution control, Equations, Mathematics, Effluents, Water pollution, Chemical analysis, Suspensions, Fibers(Plant), *Pollutant identification.
Identifiers: Pollution load, Conversion factors.

Cinversion factors are tabulated for changing analytically determined effluent pollution loads (ppm) into the more practical lb per ton (of unbleached oven-dry pulp) expression. A mathematical formula for appropriate calculations at other than listed fiber concentrations (1-15%) is also given. (Brown-IPC)
W75-06884

TRACE ANALYSIS OF PHENOLS IN WATER BY GAS CHROMATOGRAPHY,
Fisheries and Marine Service, Winnipeg (Manitoba).
Journal of the Fisheries Research Board of Canada, Vol 32, No 2, p 292-294, February, 1975. 1 tab, 7 ref.

Descriptors: *Water analysis, *Gas chromatography, *Phenols, *Pollutant identification, Analytical techniques, Pollutants, Water pollution sources, Water properties, Water quality, Water, Water chemistry, Organic compounds, Organic matter, Aromatic compoounds, Chemicals, Industrial wastes, Chemical wastes, Chemical analysis, Chromatography.
Identifiers: Cresols, Xylenols.

A method for the analysis of low concentrations of phenols, cresols, and xylenols in water samples was developed. Ortho-xylene is added as an internal standard and the sample is extracted one with chloroform to remove a portion of the total organic material present. The phenols are converted to their trimethylsilyl derivatives and analyzed by gas chromatography. The method is rapid and requires a minimum of sample manipulation. The lower limit od detection is 0.100 mg/liter for phenol, 0.025 mg/liter for cresols, and 0.050 mg/liter for xylenols. (Witt-IPC)
W75-06890

MERCURY IN THE WESTERN ENVIRONMENT.
Proceedings of a Workshop, Portland, Oregon, February 25-26, 1971. Continuing Education Publications, Corvallis, Oregon, 1973, D.R. Buhler, Editor, 360 pages, 82 fig, 98 tab, 390 ref.

Descriptors: *Mercury, *Toxicity, *Public health, *Conferences, Organic compounds, Inorganic compounds, Surface waters, Pollutants, Water pollution, Fish, Aquatic life, Food chains, Sediments, Oysters, Biology, Lead, Animal physiology, Analytical techniques, Spectroscopy, Chromatography, *Path of pollutants, Pollutant identification, Heavy metals.

A compilation of information on the sources and effects of mercury in the western environment is presented. The book is divided into four sections (Mercury in the Aquatic Environment, Mercury in the Terrestrial Environment, Analysis of Mercury and Methylmercury, and Toxicity of Mercury Compounds) and includes a discussion at the end of each section. The book is based on proceedings of a workshop organized to bring together individuals concerned with the sources and distribution of mercury in the western United States and Canada, the effects of mercury contamination on fish and wildlife; the analysis of mercury; and the nature and occurrence of mercury-related damage to man. It also provided, to a degree, a status report of contemporary research on mercury pollution and toxicity. (See W75-06898 thru W75-06930)
W75-06897

SOURCES AND PRESENT STATUS OF THE MERCURY PROBLEM,
Hope Coll., Holland, Mich. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-06898

MERCURY IN THE STATE OF WASHINGTON,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5B.
W75-06900

THE DISTRIBUTION OF MERCURY IN SEDIMENT CORES FROM BELLINGHAM BAY, WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-06901

MERCURY CONCENTRATIONS IN FISH,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
C. Henderson, and W. E. Shanks.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 45-58, 1973. 1 fig, 5 tab, 3 ref.

Descriptors: *Mercury, *Fish, *Sampling, *Distribution, Toxicity, Monitoring, Data collections, Regions, Analytical techniques, Spectroscopy, *Pollutant identification, Heavy metals.

As a part of the National Pesticide Monitoring Program, mercury analyses were conducted on composite fish samples collected by the U.S. Bureau of Sport Fisheries and Wildlife (BSFW) in the fall of 1969 and 1970. Three composite samples, each of a different species and consisting of three to five adult fish, were collected at each of 50 monitoring stations in 1969 and at each of 100 monitoring stations in 1970 located on major rivers and lakes throughout the United States. In 39 composite samples from 14 stations collected in 1969 in BSFW Region 1 (Pacific) and Alaska, detectable levels were found in all samples with values ranging from 0.06-1.25 ppm. In the fall of 1970, all 84 composite samples from 23 stations in BSFW Region 1 and Alaska contained mercury residues with values ranging from 0.05-1.7 ppm. Mean (0.26 ppm) and median (0.17 ppm) values were slightly higher than in other BSFW regions. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06902

MERCURY IN AQUATIC SPECIES FROM THE PACIFIC NORTHWEST,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
D. R. Buhler, R. R. Claeys, and W. E. Shanks.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 59-75, 1973. 1 fig, 7 tab, 18 ref. USPHS (ES 00210).

Descriptors: *Distribution, *Mercury, *Fish, *Pacific Northwest U.S., Aquatic animals, Freshwater, Estuaries, Rivers, Lakes, Bays, Data collections, Idaho, Oregon, Washington, Analytical techniques, Spectroscopy, Laboratory tests, Sampling, Toxicity, *Pollutant identification, Heavy metals.

Freshwater and estuarine organisms were collected from various rivers, lakes and bays in Idaho, Oregon, Washington and northern California and the muscle tissue then analyzed for mercury via flameless atomic absorption. Mercury was present in all samples tested with the highest concentration 1.98 ppm, occurring in a northern squawfish taken from the Snake River. At least 80-90% of the mercury found in the muscle tissue was in the methylmercury form. The mercury content of the fishes varied appreciably according to species. Approximately 85% of the brown bullhead, 77% of the northern squawfish, 54% of the channel catfish, 47% of the largemouth bass, and 11% of the white sturgeon examined contained mercury concentrations that exceeded the 0.5 ppm guidelines value set by the U.S. Food and Drug Administration. Other freshwater fish species showed lower mercury levels and anadromous fishes such as adult chinook and coho salmon, collected in freshwater had the lowest mercury content. The sampling location had considerable influence on the mercury concentrations found in a given fish species. Fish from the Coast Fork of the Willamette River and Antelope Reservoir in Oregon and the Snake River in Idaho, Oregon and Washington contained especially high mercury levels. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06903

MERCURY RESIDUES IN IDAHO FISHES - 1970,
Idaho Dept. of Fish and Game, Boise.
S. Gebhards, J. Cline, F. Shields, and L. Pearson.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 76-80, 1973. 1 fig, 2 tab, 3 ref.

Descriptors: *Fish, *Mercury, *Idaho, *Distribution, Toxicity, Public Health, Sampling, Analytical techniques, Spectroscopy, Rivers, Foods, Mining, Mining wastes, Water pollution, *Pollutant identification, Heavy metals.
Identifiers: *Snake River(Idaho).

A total of 160 fish samples, representing 19 species were collected from 18 areas in Idaho. Mercury residues were determined by neutron activation analysis. Detectable mercury was found in 98% of the samples with the highest residue, 1.7 ppm found in a Squawfish. A total of 19% of the fish tested contained or exceeded the 0.5 ppm U.S. Food and Drug Administration guideline for mercury residues in human foods. Data suggested that channel catfish, yellow perch, and suckers accumulate higher mercury levels than other species taken from the same waters. Fish from reservoir sections of the Snake River contained higher mercury levels than those collected from free-flowing river sections. Large quantities of quicksilver lost during mining activities in the late 1860's may be responsible for the elevated mercury residue in fish from Jordan Creek, Idaho. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06904

FDA'S PROGRAM OF MERCURY IN FOODS,
Food and Drug Administration, Seattle, Wash.
For primary bibliographic entry see Field 5G.
W75-06905

THE RATE OF LOSS OF MERCURY BY PACIFIC OYSTERS,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W75-06906

MERCURY IN FUR SEALS,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Biological Lab.
For primary bibliographic entry see Field 5C.
W75-06907

MERCURY LEVELS IN CALIFORNIA SEA LIONS,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 5C.
W75-06908

THE GENERAL AND COMPARATIVE BIOLOGY OF TOXIC METALS AND THEIR DERIVATIVES: MERCURY AND LEAD,
Hawaii Univ., Honolulu. Environmental Center.
For primary bibliographic entry see Field 5C.
W75-06909

MERCURY CONTAMINATION IN CALIFORNIA'S FISH AND WILDLIFE,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 5C.
W75-06910

PRELIMINARY STUDIES OF MERCURY TISSUE LEVELS FROM GAME BIRDS AND FISH IN UTAH,
Utah State Univ., Logan. Dept. of Toxicology.
For primary bibliographic entry see Field 5C.
W75-06911

MERCURY-WILDLIFE STUDIES BY THE DENVER WILDLIFE RESEARCH CENTER,
Bureau of Sport Fisheries and Wildlife, Denver, Colo. Denver Wildlife Research Center.
For primary bibliographic entry see Field 5C.
W75-06912

MERCURY IN PHEASANTS AND OTHER BIRDS FROM EASTERN WASHINGTON,
Washington State Dept. of Game, Olympia.
For primary bibliographic entry see Field 5C.
W75-06913

MERCURY LEVEL STUDIES IN MIGRATORY WATERFOWL,
Reed Coll., Portland, Oreg. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W75-06914

MERCURY IN HUNGARIAN PARTRIDGE AND IN THEIR NORTH CENTRAL MONTANA ENVIRONMENT,
Montana Fish and Game Dept., Choteau.
For primary bibliographic entry see Field 5C.
W75-06915

AN ANALYSIS OF MERCURY RESIDUES IN IDAHO PHEASANTS,
Idaho State Dept. of Health, Boise.
For primary bibliographic entry see Field 5C.
W75-06916

SEASONAL VARIATIONS IN MERCURY CONTENT OF OREGON PHEASANTS,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 5C.
W75-06917

PHEASANT FEEDING STUDY USING SEEDS TREATED WITH METHYL AND PHENYLMERCURY,
Bureau of Sport Fisheries and Wildlife, Boise, Idaho. Div. of River Basin Studies.
For primary bibliographic entry see Field 5C.
W75-06918

INTRODUCTION TO THE ANALYTICAL METHODS FOR THE DETERMINATION OF MERCURY COMPOUNDS,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
R. R. Claeys.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 229-233, 1973. 1 fig, 10 ref.

Descriptors: *Mercury, Organic compounds, Inorganic compounds, *Analytical techniques, Colorimetry, Spectroscopy, Chromatography, Research and development, *Reviews, *Pollutant identification, Heavy metals.

Various methods for the determination of mercury and its compounds were described briefly. The development of the analytical methods used for the analysis of mercury in the environment was summarized. Colorimetry, atomic absorption, neutron activation, and gas chromatography were discussed, and general comparisons of the methods were made. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06919

NONFLAME METHODS FOR MERCURY DETERMINATION BY ATOMIC ABSORPTION: A REVIEW,
Perkin-Elmer Corp., Burlingame, Calif.
A. A. Koch, and D. C. Manning.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 234-241, 1973. 43 ref.

Descriptors: *Mercury, *Analytical techniques, *Spectroscopy, Research and development, Laboratory tests, Testing procedures, *Reviews, *Pollutant identification, Heavy metals.
Identifiers: *Atomic absorption spectroscopy.

A summary was presented of the published work on the determination of mercury at trace concentrations by nonflame atomic absorption spectroscopy. These methods involved either the reduction of the mercury to elemental form and subsequent determination of the free mercury in an absorption cell or the deposition of mercury onto a base metal from the sample solution and subsequent thermal release of the mercury into an absorption cell. Detection limits of less than 0.001 micrograms were possible using these procedures. The cold vapor stannous chloride method for atomic absorption was substantially more sensitive than the standard solution nebulization sampling techniques. It is relatively easy to convert a standard flame atomic absorption instrument to determine mercury by this method. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06920

SEMI-AUTOMATED DETERMINATION OF MERCURY IN FISH TISSUE,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
F. A. J. Armstrong, and J. F. Uthe.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 242-249, 1973. 4 fig, 2 tab, 4 ref.

Descriptors: *Mercury, *Fish, Animal physiology, *Analytical techniques, Research and development, *Automation, *Pollutant identification, Heavy metals.

An automated method for determination of mercury was described. Samples of the tissue were digested with nitric and sulphuric acids, oxidized with potassium permanganate and cleared with hydrogen peroxide. Mercury was then reduced with hydroxylamine sulfate and stannous sulfate and the vapor equilibrated with air using Technicon Auto Analyzer equipment and determined by flameless atomic absorption spectrometry at a rate of 30 samples per hour. The standard deviation of the methods is plus or minus 0.04 at the 0.5 ppm level. The automated method is rapid and may be completed in under eight hours, although routine analysis usually takes 24 hours. For inspection work it is therefore to be preferred over neutron activation analysis. Precision and accuracy are adequate for most inspection and research purposes. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06921

AN INSTRUMENTAL NEUTRON ACTIVATION METHOD FOR THE DETERMINATION OF MERCURY: WITH COMPARISONS TO ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Oregon State Univ., Corvallis. Radiation Center.
P. J. Mellinger, and V. N. Smith.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 250-256, 1973. 1 fig, 3 tab, 4 ref.

Descriptors: *Mercury, *Analytical techniques, *Instrumentation, Radiosiotopes, Tracers, Spectroscopy, Colorimetry, *Neutron activation analysis, *Pollutant identification, Heavy metals.
Identifiers: Atomic absorption spectrophotometry.

An instrumental neutron activation analysis method using the Hg196 (n, gamma) Hg197 and the Hg202 (n, gamma) Hg 203 reaction was described for the determination of trace quantities of mercury in biological tissue. Samples were irradiated for three hours in a thermal neutron flux of 1.2 x 10 to the 12th power neutrons per sq cm/sec and allowed to decay for 10 days prior to measurement with a 30 cu cm Ge(Li) detector (resolution of 2.5 kev) coupled to a 2,048 channel gamma ray analyzer. Interlaboratory comparisons were made using flameless atomic absorption spectrophotometry and colorimetry with good agreement. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06922

NEUTRON ACTIVATION ANALYSIS FOR THE DETERMINATION OF MERCURY IN ENVIRONMENTAL SAMPLES,
Washington State Univ., Pullman. Nuclear Radiation Center.
R. H. Filby, A. I. Davis, and K. R. Shah.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 257-264, 1973. 1 fig, 2 tab, 17 ref.

Descriptors: *Mercury, *Analytical techniques, *Neutron activation analysis, Evaluation, Instrumentation, Radioisotopes, Tracers, Spectroscopy, *Pollutant identification, Heavy metals.

An instrumental neutron activation analysis procedure using the Hg202 (n, gamma) Hg203 reaction was described for the determination of mercury in biological tissues, water, and other environmental materials. Reactor irradiation at a thermal neutron flux of 5 x 10 to the 12th power neutrons/sq cm/sec was followed by a six-week decay period and measurement of Hg203 using a Ge(Li) spectrometer system. The method was precise and the sensitivity varied with sample matrix. For mammalian blood, the detection limit was 3.0 ppb mercury. The advantages and disadvantages of activation analysis compared with atomic absorption, spectrophotometric methods, and emission spectrography were discussed. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06923

A RAPID SEMIMICRO METHOD FOR METHYLMERCURY RESIDUE ANALYSIS IN FISH BY GAS CHROMATOGRAPHY,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. Solomon, and J. F. Uthe.

In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 265c272, 1973. 3 fig, 2 tab, 6 ref.

Descriptors: *Mercury, *Fish, *Analytical techniques, Chromatography, Organic compounds, Animal physiology, Laboratory tests, Research and development, Spectroscopy, *Pollutant identification, Heavy metals, *Gas chromatography.
Identifiers: Gas liquid chromatography, *Methylmercury.

A rapid gas chromatographic method for the determination of the methylmercury content of fish tissues was described. This semimicro method eliminated evaporation steps and lowered the handling dangers for the chemist. Dimethylmercury and other mercurials did not interfere with monomethylmercury in this method. It worked well for the determination of methylmercury, and duplicate analysis of samples gave values that agreed within 2%. Atomic absorption and thin-layer chromatography were used to confirm the presence of methylmercury in the final extracts. Analysis of fish from many areas with this method indicates that the mercury present in fish is essentially all methylated. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06924

THE HUMAN HEALTH HAZARDS OF METHYLMERCURY,
Mayo Clinic, Rochester, Minn. Dept. of Medical Statistics, Epidemiology and Population Genetics.
For primary bibliographic entry see Field 5C.
W75-06925

EXPERIMENTAL PORCINE METHYLMERCURIALISM,
Washington State Univ., Pullman. Dept. of Veterinary Pathology.
For primary bibliographic entry see Field 5C.
W75-06926

THE HUMAN MORPHOLOGICAL LESIONS OF METHYLMERCURY INJURY,
Washington Univ., Seattle. Dept. of Pathology.
For primary bibliographic entry see Field 5C.
W75-06927

METHYLMERCURY TOXICITY: A PROBABILISTIC ASSESEMENT,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5C.
W75-06928

MERCURY CONTAMINATION-PRIBILOF ISLANDS,
Center for Disease Control, Atlanta, Ga.
For primary bibliographic entry see Field 5C.
W75-06929

THE PHARMACODYNAMICS OF MERCURY AND ITS COMPOUNDS WITH EMPHASIS ON THE SHORT-CHAIN ALKYLMERCURIALS,
Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.
For primary bibliographic entry see Field 5C.
W75-06930

EFFECTS OF CERTAIN CHEMICAL POLLUTANTS ON SMALL AQUATIC ANIMALS,
Kansas Water Resources Research Inst., Manhattan.
E. C. Bovee.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 336, $3.25 in paper copy, $2.25 in microfiche. KWRRI Contribution No. 157, January 1975. 11 p, 4 fig, 9 ref. OWRT A-058-KAN(1). 14-31-0001-3816.

Descriptors: *Cadmium, Calcium, *Protozoa, Water pollution effects, *Bioassay, Cations, *Pollutant identification, Heavy metals, *Toxicity, *Bioindicators, Thermal pollution.
Identifiers: *Photomicrography, Tetrahymena pyriformis.

A quick, accurate, photomicrographic method has been developed for bioassaying the presence and concentration of heavy-metals pollutants in water. The method detects toxic levels of pollutants and for a single toxic metal will detect one part of metal in one billion parts of water. The animal used, the ciliated protozoan, Tetrahymena pyriformis, is easily and cheaply raised in the laboratory and is poisoned by about the same levels of metals as the blue-gill sunfish. The bioassay is run in less than half a day, including developing and analysis of films of the locomoting animal on which the assay depends. With reference-graphs of the pollutants, the method is potentially of practical use to laboratories interested in detecting presence and amounts of pollutants in a water source or plant-effluent. In 'hard' waters calcium, especially, and other non-toxic cations, e.g., sodium, potassium, magnesium, partly inhibit toxic effects of heavy metals. 'Hard' waters can therefore carry a slightly larger burden of toxic metals than can 'soft' waters which have little or no mineral content. At higher temperatures in water, toxic effect of heavy metals, e.g., cadmium, is noticeably increased. This suggests that waters heated by thermal pollution can carry a lesser burden of toxic pollutants than cooler waters, and less in summer months than in cooler months.
W75-06981

LIGHT INITIATED REACTIONS IN WATER CONTAINING CHELATED METAL IMPURITIES,
North Dakota State Univ., Fargo. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W75-06994

ACID PRECIPITATION IN THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, N.Y. Section of Ecology and Systematics.
For primary bibliographic entry see Field 5B.
W75-07057

COPPER IN SURFACE WATERS SOUTH OF NEW ZEALAND,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 2K.
W75-07060

CUMULATIVE CHEMICAL LIGHT METER,
Westinghouse Research Labs., Pittsburgh, Pa.
G. D. Dixon, D. H. Davies, and J. D. Voytko.
Environmental Science and Technology, Vol 9, No 3, p 234-237, March 1975. 6 fig, 5 ref.

Descriptors: *Pollutant identification, *Light intensity, *Photoactivation, *Instrumentation, *Photoperiodism, Analytical techniques, Light, Photosynthesis, Solar radiation, Radiation, Chemistry, Spectrophotometry, Chlorophyll, Energy conversion, Primary productivity, Measurement, Viscosoty.
Identifiers: *Chemical light meter, *Actinometers, Photoisomerization, Photochemical degradation, Gardner-Holdt viscosity tube, Chemical actinometer.

A cumulative light meter was devised based on the light-induced degradation of aqueous polymer solutions. The viscosity of the solution can be related to the total amount of incident light absorbed. The system possesses a number of significant advantages over competitive actinometers. It is very cheap, needs no extra equipment or skilled personnel, and can be simply modified to respond to any desired spectral region. (Henley-ISWS)
W75-07063

INSTRUMENTS FOR WATER QUALITY MEASUREMENTS,
California Univ., Berkeley. Lawrence Berkeley Lab.
S. L. Phillips, and D. A. Mack.
Environmental Science and Technology, Vol 9, No 3, p 214-220, March 1975. 5 tab.

Descriptors: *Pollutant identification, *Instrumentation, *Analytical techniques, *Measurement, *Water quality, *Water analysis, Chemical analysis, Chromatography, On-site tests, Water measurement, Evaluation, Laboratory tests, Trace elements, Water chemistry, Nutrients, Quality control, Testing, Colorimetry, Testing procedures, Pesticides, Monitoring, Metals, Carbon, Mineralogy, Automation.
Identifiers: AutoAnalyzer, Gas membrane electrodes.

Techniques were discussed that form the basis of current commercial or developing techniques for measuring metals, nutrients, pesticides, and oxygen demand in water supplies. The discussion gives a general picture of the instrumentation available. Listings of instrument manufacturers were included. (Henley-ISWS)
W75-07065

STUDY OF TRACE ELEMENTS IN WATERS OF TWO ALASKAN RESERVOIR SITES,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W75-07100

ADVANCED PLANNING OF FLOOD CONTROL PROJECTS,
Santa Clara County Flood Control and Water District, San Jose, Calif.
For primary bibliographic entry see Field 6B.
W75-07139

EXAMINATION OF WATERS: EVALUATION OF METHODS FOR SELECTED CHARACTERISTICS.
Australian Water Resources Council, Canberra (Australia).
Technical Paper No. 8, 1974. 109 p. J. A. McGlynn, compiler.

Descriptors: *Water quality, *Analytical techniques, *Water analysis, *Laboratory tests, Water pollution, Water chemistry, Sampling, Testing, Trace elements, Chemical analysis, Instrumentation, Nitrates, Phosphorus, Colorimetry, Ions, Electrodes, Chemical properties, Metals, Oily water, Oil wastes, Oil pollution, Mercury, Freshwater, Sea water, Standards, Methodology, Testing procedures, *Pollutant identification.
Identifiers: *Standard methods, Mineral oil.

The eight papers presented provide up-to-date information on analytical techniques to aid in the selection and practical implementation of new and improved methods and to give increased precision and accuracy of laboratory data as well as increased productivity and improved laboratory efficiency. Subjects included: (1) a review of methods for the determination of nitrate in waters, (2) methods for determination of phosphorus in waters, (3) an evaluation of new methods for the determination of ammonia in water, (4) a review of mercury analysis and sampling techniques, (5) instrumental methods for the determination of trace metals in water, (6) determination of mineral oil in water, (7) a review of techniques for the characterization and identification of oil spillages, and (8) the automation of routine analysis of water. Recommendations were given for future research into improvement of water quality assessment

techniques. (See W75-07155 thru W75-07162) (Humphreys-ISWS)
W75-07154

A REVIEW OF METHODS FOR THE DETERMINATION OF NITRATE IN WATERS,
Chemical and Bacteriological Labs., Melbourne (Australia).
J. R. Huxley, and D. Wisel.
In: Examination of Waters: Evaluation of Methods for Selected Characteristics; Australian Water Resources Council Technical Paper No. 8, p 13-20, 1974. 1 tab, 39 ref.

Descriptors: *Chemical analysis, *Nitrates, *Pollutant identification, *Analytical techniques, *Reviews, Nitrogen compounds, Chemical wastes, Spectrophotometry, Ultraviolet radiation, Ions, Electrodes, Reduction(Chemical), Chemical reactions, Nitrites, Inorganic compounds, Pollutants.
Identifiers: Ultraviolet spectrophotometry, Ion-selective electrode methods.

Methods for the determination of nitrate in water and wastewater were reviewed and compared as to range and potential interferences. Poor results obtained from inter-laboratory trials carried out by other workers revealed the generally unsatisfactory nature of commonly used methods, particularly at concentrations below a few mg/l NO3-N. Methods discussed include phenoldisulphonic acid, brucine, UV spectrophotometry, selective-ion electrode, and those based on reduction to nitrite. For use at concentrations between 1 and 10 mg/l NO3-N, the automated hydrazine method appeared marginally the most precise and subject to the least interferences. No method could be recommended in severely polluted water except perhaps the selective ion electrode method if the alkalinity and chloride are low, the ionic strength does not vary significantly from sample to sample, and the nitrate concentration is above 2 mg/l NO3-N. For determination at extremely low concentrations, the choice was between the two cadmium reduction methods, although these may be subject to interference in some situations. (See also W75-07154) (Sims-ISWS)
W75-07155

METHODS FOR DETERMINATION OF PHOSPHORUS IN WATERS,
Western Australia Government Chemical Labs., Perth.
N. Platell, and P. N. Jack.
In: Examination of Waters: Evaluation of Methods for Selected Characteristics; Australian Water Resources Council Technical Paper No. 8, p 21-25, 1974. 30 ref.

Descriptors: *Chemical analysis, *Phosphorus, *Pollutant identification, *Analytical techniques, Chemical wastes, Pollutants, Oxidation, Digestion, Nutrients, Colorimetry, Color reactions, Laboratory tests.
Identifiers: Interferences(Chemical).

Marine and freshwater biologists have traditionally studied water phosphorus levels. The more widespread interest has come with the increased interest in pollution and it is pertinent to consider what to look for and to revise available methods. Examination of recent reviews and articles indicated that total phosphorus is the only definite measurable phosphorus form, that perchloric acid oxidation/digestion is the most satisfactory method of measurement, and that, except for arsenic 5+, interferences are negligible in the molybdenum blue method. After conversion to orthophosphate, automatic methods could be applied. The recommended methods is that of Murphy and Riley (1962), with modifications in regard to sample preparation, i.e., digestion, sample size, and reagent preparation. (See also W75-07154) (Sims-ISWS)
W75-07156

AN EVALUATION OF NEW METHODS FOR THE DETERMINATION OF AMMONIA IN WATER,
Brisbane City Council (Australia).
J. Kennewell, and N. Long.
In: Examination of Waters: Evaluation of Methods for Selected Characteristics; Australian Water Resources Council Technical Paper No. 8, p 27-41, 1974. 11 tab, 22 ref.

Descriptors: *Chemical analysis, *Ammonia, *Pollutant identification, *Analytical techniques, Chemical wastes, Pollutants, Laboratory tests, Testing procedures, Colorimetry, Methodology, Automation.
Identifiers: Phenol hypochlorite methods, Ion-selective electrode methods.

Two new developments in the ammonia determination for waters were reviewed. One concerns two variations of the colorimetric 'indophenol blue' methods, (1) the method of Solorzano (1969) for natural waters through to saline waters and wastewater and (2) the method of Harwood and Kuhn (1970) for natural waters and wastewater. The other concerns developments based on the principle of the application of an ammonia selective-ion electrode. Although much of the information in the review relied on appraisal of the available literature, data were included and conclusions drawn from laboratory investigation of the methods under review. Comparison of the methods was made on sewage samples but most results relied on spike recoveries. All three methods appear more than satisfactory alternatives to traditional methods. (See also W75-07154) (Sims-ISWS)
W75-07157

A REVIEW OF MERCURY ANALYSIS AND SAMPLING TECHNIQUES,
Western Australia Government Chemical Labs., Perth.
N. Platell, and T. Webb.
In: Examination of Waters: Evaluation of Methods for Selected Characteristics; Australian Water Resources Council Technical Paper No. 8, p 43-51, 1974. 67 ref.

Descriptors: *Chemical analysis, *Sampling, *Mercury, *Pollutant identification, *Analytical techniques, Chemical wastes, Pollutants, Laboratory tests, Testing procedures, Methodology, Adsorption, Filtration, Spectroscopy, Colorimetry, Chromatography, Fluorescence, Neutron activation analysis.
Identifiers: Atomic adsorption spectrometry, Amalgamation, Interferences(Chemical).

In the last decade, mercury as an environmental pollutant has received a great deal of attention. In the field of water pollution in particular, this attention has shown that exceedingly low levels of mercury are of considerable significance. As a result, better sampling and analysis techniques have been required. This review deals briefly with mercury forms and significant levels, and in more detail, with sampling losses and methods of analysis. These methods include colorimetric, flameless atomic absorption with various concentration techniques and interferences, neutron activation, atomic fluorescence and gas chromatography. (See also W75-07154) (Sims-ISWS)
W75-07158

INSTRUMENTAL METHODS FOR THE DETERMINATION OF TRACE METALS IN WATER,
New South Wales Dept. of Mines, Sydney (Australia). Chemical Lab.
J. A. McGlynn.
In: Examination of Waters: Evaluation of Methods for Selected Characteristics; Australian Water Resources Council Technical Paper No. 8, p 53-78, 1974. 10 tab, 64 ref.

Descriptors: *Chemical analysis, *Trace elements, *Pollutant identification, *Analytical techniques, *Metals, Spectroscopy, Polarographic analysis, Methodology, Sampling, Laboratory tests, Water chemistry, Instrumentation, Electrodes, Ion exchange, Chemical wastes, Pollutants.
Identifiers: Atomic absorption spectrometry, Anodic stripping voltammetry, Concentration techniques, Interferences(Chemical), Trace metals.

Instrumental methods for the determination of trace metals in water at or below typical water supply standards were reviewed. Discussion included the application of methods based on atomic absorption spectrometry, differential pulse polarography, and anodic stripping voltammetry. Techniques for concentration of metals to allow adequate sensitivities for the various methods were also discussed. The need for care both in selection of pretreatment technique to ensure measurement of total metal content, and in control of calibration by standard addition was emphasized. Anodic stripping voltammetry was recommended for those metals suited to it, or direct flame atomic absorption spectrometry if concentrations and salinity permit. (See also W75-07154) (Sims-ISWS)
W75-07159

DETERMINATION OF MINERAL OIL IN WATER,
Victoria Dept. of Agriculture (Australia). Div. of Agricultural Chemistry.
R. S. Belcher.
In: Examination of Waters: Evaluation of Methods for Selected Characteristics; Australian Water Resources Council Technical Paper No. 8, p 79-83, 1974. 12 ref.

Descriptors: *Chemical analysis, *Oil, *Pollutant identification, *Analytical techniques, Oily water, Sea water, Oil pollution, Water pollution, Pollutants, Separation techniques, Infrared radiation, Ultraviolet radiation, Spectrophotometry, Chromatography, Gravimetry, Fluorescence, Absorption, Evaporation, Water chemistry, Oil spills.
Identifiers: Atomic absorption spectrometry, Fluorescence spectrography.

Methods in use for determination of low-level mineral oil contamination of water were reviewed and some limitations on efficiency of extraction of the oil, separation of natural substances, and measurement of levels of pollution were noted. A method involving infrared spectrophotometry and a new extraction procedure developed by the Division of Agricultural Chemistry was given in detail and its advantages and disadvantages were discussed. This topic, while currently of special interest for the examination of sea water for residues from oil contamination is also potentially important in the investigation of oil pollution of freshwater bodies and streams. (See also W75-07154) (Sims-ISWS)
W75-07160

A REVIEW OF TECHNIQUES FOR THE CHARACTERISATION AND IDENTIFICATION OF OIL SPILLAGES,
New South Wales Dept. of Mines, Sydney (Australia). Chemical Lab.
J. A. McGlynn.
In: Examination of Waters: Evaluation of Methods for Selected Characteristics; Australian Water Resources Council Technical Paper No. 8, p 85-89, 1974. 21 ref.

Descriptors: *Chemical analysis, *Pollutant identification, *Oil, *Oil spills, Analytical techniques, Spectrometry, Water pollution sources, Absorption, Oil pollution, Infrared radiation, Ultraviolet radiation, Chromatography, Metals, Fluorescence, Separation techniques.
Identifiers: Infrared absorption spectrometry, Ultraviolet absorption spectrometry, Ultraviolet fluorescence, Trace metals.

The value of a wide range of techniques to match oil spill samples with oil from possible sources was discussed. Techniques include infrared absorbance, ultraviolet fluorescence, ultraviolet absorbance, paper chromatography, trace metal ratios, and specification properties such as sulphur, viscosity, and specific gravity. An addendum included techniques which were considered most useful for comparison of oil spillages to possible sources. (See also W75-07154) (Sims-ISWS)
W75-07161

THE AUTOMATION OF ROUTINE COLORIMETRIC ANALYSIS OF WATER,
New South Wales Dept. of Mines, Sydney (Australia). Chemical Lab.
J. A. McGlynn.
In: Examination of Waters: Evaluation of Methods for Selected Characteristics; Australian Water Resources Council Technical Paper No. 8, p 91-97, 1974. 2 fig, 1 tab, 21 ref.

Descriptors: *Colorimetry, *Automation, Cost-benefit analysis, *Chemical analysis, Analytical techniques, Pollutant identification, Digestion, Distillation, Economics, Cost-benefit ratio, Instrumentation, Laboratory tests, Testing procedures.
Identifiers: Interferences(Chemical), Cross contamination.

The value of automated colorimetry for analysis of routine water samples was examined. Operational considerations and limitations were discussed together with an approximate cost-benefit analysis based on labor and capital costs for equipment. Subject to limitations, the use of automatic analyzer techniques was recommended where economically justified. (See also W75-07154) (Sims-ISWS)
W75-07162

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. I PIGMENTS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W75-07167

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. II ISOPRENOIDS,
California Univ., Los Angeles. Dept. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W75-07168

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. III ALIPHATIC AND STEROIDAL ALCOHOLS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W75-07169

GEOCHEMICAL ANALYSIS OF STREAM SEDIMENTS AS A TOOL FOR ENVIRONMENTAL MONITORING: A PIGYARD CASE STUDY,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.
G. R. Alther.
Geological Society of America Bulletin, Vol 86, No 2, p 174-176, February 1975. 8 fig, 2 tab, 2 ref.

Descriptors: *Geochemistry, *Sediments, *Environmental effects, *Monitoring, Analysis, Feed lots, Farm wastes, Chemical analysis, *Canada, Streambeds, Magnesium, Calcium, Sodium, Potassium, Zinc, Copper, Lead, Cobalt, Nickel, Iron, Manganese, Statistical methods, Flame photometry, Water pollution, Pollutant identification.
Identifiers: *St. Catharines(Ontario), Pigs, Chi-square test, Atomic absorption.

A geochemical analysis of 11 chemical elements in stream sediments in the vicinity of a pig farm shows that geochemical exploration methods can be used for regional environmental monitoring of organic pollution. In a 5-sq mi area in southern Ontario, contaminated stream sediments showed definite increases in Mg, Ca, Na, K, and Zn. Changes in Cu content were inconclusive; Pb, Co, Ni, Fe, and Mn showed background averages. The study showed that stream sediments are affected by large-scale agricultural operations within a short period of time. It is conclusive that groundwater will be affected as contamination continues. (Visocky-ISWS)
W75-07188

PRINCIPAL-COMPONENT ANALYSIS OF STREAMFLOW CHEMICAL QUALITY DATA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-07200

URBAN STORM RAINFALL-RUNOFF-QUALITY INSTRUMENTATION,
Geological Survey, Reston, Va.
G. F. Smoot, J. Davidian, and R. H. Billings.
In: Flash Floods; Proceedings of Paris Symposium, September 1974: International Association/Hydrological Sciences Publication No 112, p 44-47, 1974. 2 fig.

Descriptors: *Instrumentation, *Urban hydrology, *Urban runoff, Storm runoff, Rainfall-runoff relationships, Sampling, Water quality, Sewers, Stream gages, Data collections, Precipitation gages, Data processing.

A project was initiated to develop the necessary instrumentation to study urban runoff and has resulted in an intergrated system, including precipitation gages, a sewer flow measuring device, automatic sampler, clock, recorder, and necessary logic. The precipitation gages are the tipping bucket type having a readability of 0.25 mm. The flow measuring device functions within the sewer under both open-channel and pressure flow conditions, the meter is a venturi flume whose constricted bottom forces subcritical depths to form upstream, with the flow passing through critical depth at the throat. In pipes having very steep slopes, the flow remains supercritical both upstream from and through the constriction. The device is a modified venturi meter for pressure flows. In the transition between open-channel and pressure flows, the upstream pipe is full whereas the throat and downstream pipe are partly full. The water sampler collects 24 two-litre samples at predetermined time intervals, holding them refrigerated until they are analyzed. Data are recorded on a single recorder along with time so that all parameters are time correlated. Presently, these instrumentation systems are being installed in several sewered catchment basins throughout the United States. (Knapp-USGS)
W75-07202

GROUND-WATER DATA, 1973, INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W75-07215

QUALITY OF THE GROUND WATER IN BASALT OF THE COLUMBIA RIVER GROUP, WASHINGTON, OREGON, AND IDAHO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W75-07217

AN AUTOMATED TECHNIQUE FOR TOTAL DISSOLVED FREE AMINO ACIDS IN SEAWATER,
Oregon State Univ., Corvallis. School of Oceanography.
D. D. Coughenower, and H. C. Curl, Jr.
Limnology and Oceanography, Vol 20, No 1, p 128-131, January 1975. 1 fig, 3 tab, 8 ref. NOAA Contract 2-35187.

Descriptors: *Pollutant identification, *Amino acids, *Sea water, *Automation, *Colorimetry, *Analytical techniques, Analysis, Spectroscopy, Chemistry, Color reactions, Evaluation, Instrumentation, Testing, Testing procedures, Measurement, Salinity, Organic compounds, Estuaries, Nitrogen compounds, Nutrients.
Identifiers: *Ninhydrin solution, Hydrazine sulfate, Salt effect, Proline, Cystine, Arginine, Histidine.

An automated method for total dissolved free amino acid in seawater, using an air-stable ninhydrin solution, is most suitable as a field method providing real time information. Data taken in two estuaries were presented to show the distribution of total amino acid. (Henley-ISWS)
W75-07247

MICROBIAL TRANSFORMATIONS OF MERCURY IN AQUATIC ENVIRONMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-07275

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 1, SCOPE OF STUDY AND REVIEW OF AVAILABLE DATA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2H.
W75-07286

AMCHITKA BIOENVIRONMENTAL PROGRAM. LIMNOLOGY OF AMCHITKA ISLAND, ALASKA,
Battelle Columbus Labs., Ohio.
R. D. Burkett.
Available from the National Technical Information Service, Springfield, Va 22161 as BMI-171-153, $4.00 in paper copy, $2.25 in microfiche. Final Summary Report and Progress Report, March 1974. 37 p, 4 fig, 13 tab, 19 ref, 2 append. AEC AT(26-1)-171.

Descriptors: *Environmental effects, *Alaska, *Nuclear explosions, Aquatic environment, Aquatic habitats, Biota, Plankton, Biological communities.
Identifiers: *Amchitka Island(Alaska).

Perturbations to the biota and aquatic environment resulting from the underground nuclear tests, Milrow and Cannikin, and their necessary support activities were investigated. Changes observed in lakes following Milrow were slight, most being attributed to manifestations of seasonal fluctuation and not to Milrow. Natural shifts in physical and chemical parameters plus changes in rates of metabolic parameters (heterotrophy and primary productivity) were not noticeably altered. No elimination of planktonic species or dramatic change in plankton community structure was noted. Longer term post-Cannikin reconnaisance has not produced evidence to indicate that any significant changes in chemical and biological parameters occurred due to the Cannikin ground shock wave. Several aquatic habitats were seriously altered as a result of drilling operations and general support activities. These water bodies might recover their predisturbance status following evacuation of the Island. Three lakes were partially drained due to ground-surface displacement following Milrow, and one, Heart Lake, sustained

gross morphological changes. The Cannikin detonation resulted in gross morphological changes in several lakes near SZ, rupture of a dike in a drill- and containment pond, and formation of Cannikin Lake in the Cannikin subsidence crater, which, as of 1972, contains the largest water volume on the island. (Jones-Wisconsin)
W75-07293

WORKSHOP ON SAMPLE PREPARATION TECHNIQUES FOR ORGANIC POLLUTANT ANALYSIS HELD AT DENVER, COLORADO ON 2-4 OCTOBER 1973.
National Field Investigations Center-Denver, Colo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-232 015, $3.75 in paper copy, $2.25 in microfiche. November 1973. 40 p.

Descriptors: *Analytical techniques, *Sampling, *Organic compounds, *Pollutant identification, Industrial wastes, Chemicals, Quality control, Separation techniques, Distillation, Chromatography.
Identifiers: Resin-column samplers, Sample preservation.

Various sampling methods and analytical techniques of industrial organic chemicals discharged into surface waters are discussed. Many techniques are currently used to analyze industrial effluents, natural waters, bottom sediments, and aquatic biota for industrial and agricultural organic-chemical pollutants. Sample contamination is discussed in detail. Considerable interest is shown in macroreticular resins for integrated sampling. Petroleum-containing samples are preserved by the addition of sulfuric acid, while formalin was suggested for PCB-containing samples. Tissue- and bottom-sediment samples are preserved by freezing. Extraction procedures cover a wide variety of techniques whereby the organic pollutant(s) of interest are transferred from the inorganic or biological matrix and usually concentrated prior to chemical characterization. Samples that are too complex to be separated under normal gas chromatographic conditions are usually subjected to some form of fractionation during, or after, extraction. Thin-layer chromatography is a recommended technique in view of its low cost and the visual impact it can have in a courtroom. Probably the most promising cleanup technique is some form of automated gel-permeation chromatography. The qualitative and quantitative aspects of quality control in the organic laboratory are prescribed. (Jones-Wisconsin)
W75-07295

THE BOD5/DO RATIO. A NEW ANALYTICAL TOOL FOR WATER QUALITY EVALUATION,
Environmental Protection Agency, Philadelphia, Pa. Region III.
N. W. Melvin, and R. H. Gardner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-230 358, $3.75 in paper copy; $2.25 in microfiche. Report EPA-903/9-73-009 (1973). 46 p, 14 fig, 1 tab.

Descriptors: *Biochemical oxygen demand, *Dissolved oxygen, *Analytical techniques, *Water quality, Streams, Water pollution, Measurement, Computer programs, Methodology, Classification, Sewage effluents, *Pollutant identification.
Identifiers: *BOD5/DO ratio, Case studies.

The two paramters, BOD and DO, are used to determine the ratio between them at each site and for each sample taken. Postulation are demonstrated and illustrated by the various situations actually occurring at stream stations across the United States. The BOD5/DO ratio is shown to be useful in evaluating the general health of streams. Assignment of ratio scales to streams can assist workers in the water pollution field to understand the actual reaction of a stream to clean-up efforts as well as to monitor any progressive changes being imposed by man-made pollution sources. Data presented indicate the ratio works well in differing stream types and can be used to evaluate the net ecological activity in streams. It can also be shown that streams exhibit varying ratios with both time and season. Those streams which are relatively clean exhibit only minor fluctuations about a central mode; conversely, degraded streams show a much larger fluctuation amplitude and the BOD5/DO trace is generally arratic. Evaluation of the long-term trend slope of the ratio trace will give a good indication of the net effect of pollution-abatement efforts. (Jones-Wisconsin)
W75-07329

5B. Sources Of Pollution

INTERRELATIONSHIPS OF VARIOUS BIOASSAY PROCEDURES FOR PULP AND PAPER EFFLUENTS,
B.C. Research, Vancouver (British Columbia).
For primary bibliographic entry see Field 5C.
W75-06867

WORLD FOCUS ON POLLUTION (ENFOQUE GLOBAL DE LA CONTAMINACION),
Investigacion y Tecnica del Papel, Vol 11, No 42, p 947-966, October, 1974.

Descriptors: *Air pollution, *Water pollution, *Industrial wastes, *Municipal wastes, Pulp and paper industry, Foreign countries, Europe, Research and development, Water pollution sources, Waste water(Pollution), Wastes, Pollutants, *Pulp wastes.
Identifiers: *Spain.

World-wide polluting activity of both industry and the general populace is briefly reviewed, and air and water contaminants emitted by Spanish industries, including the pulp and paper industry, are discussed. Although the pollution problem in Spain is not as severe as in some equally developed countries, technical investigations are being conducted to determine means of reducing industrial pollution loads before contamination diminishes the quality of life sustained by industry and the environment. (Sykes-IPC)
W75-06873

WOODY SOLIDS DISCHARGED INTO WATER COURSES BY THE FOREST PRODUCTS INDUSTRY.
For primary bibliographic entry see Field 5C.
W75-06882

MERCURY IN THE WESTERN ENVIRONMENT.
For primary bibliographic entry see Field 5A.
W75-06897

SOURCES AND PRESENT STATUS OF THE MERCURY PROBLEM,
Hope Coll., Holland, Mich. Dept. of Chemistry.
D. H. Klein.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 3-15, 1973. 3 fig, 13 ref. FWQA (16040 FRL).

Descriptors: *Mercury, *Great lakes, *Industrial wastes, *Air pollution, Surface runoff, Mining, Fossil fuels, Lead, Zinc, Copper, Legal aspects, Path of pollutants, Heavy metals.

The levels of mercury in segments of the uncontaminated environment are relatively low. Mercury contents of wildlife and sediments from much of the Great Lakes region are elevated well above these natural levels, and approach those previously observed in Sweden and Japan. Very high levels of mercury in fish are due primarily to discharge of waste mercury to the waters. However, the few data available indicate that much more mercury enters the atmosphere by voltalization, where it may be transported by winds and subsequently rained out. Analysis of the tabulated uses of mercury shows that about 3,000 tons of mined and refined mercury are wasted to the atmosphere yearly, and about half that much to the waters. Combustion of fossil fuels also contributes a few thousand tons to the atmosphere. The smelting of ores, especially of lead, zinc, and copper, is a third major source of atmospheric mercury. Urban soils are remarkably enriched in mercury, as a result of fallout from other, as yet undefined, sources. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06898

MERCURY IN THE STATE OF WASHINGTON,
Environmental Protection Agency, Seattle, Wash. Region X.
R. A. Lee.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 29-35, 1973. 2 fig, 2 ref.

Descriptors: *Mercury, *Industrial wastes, Rivers, *Distribution, *Washington, Municipal wastes, Sediments, Analytical techniques, Spectroscopy, Mining, *Path of pollutants, *Pollutant identification, Heavy metals.

Mercury levels in selected industrial and municipal wastewaters and from environmental sources were collected to determine the occurrences and distribution of mercury in the state of Washington, in accordance with state regulation and control of unnatural mercury discharges. The amount of mercury lost to waterways by each of two mercury cell chloralkali plants exhibited a dramatic decrease between April and December of 1970. Sediment samples from Bellingham Bay in an area immediately adjacent to a chloralkali plant outfall contained high mercury levels when compared to samples taken in other areas of the bay. Substantial amounts of mercury were also found to be distributed naturally in major streams and rivers. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06900

THE DISTRIBUTION OF MERCURY IN SEDIMENT CORES FROM BELLINGHAM BAY, WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
M. H. Bothner, and D. Z. Piper.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 36-44, 1973. 8 fig, 9 ref.

Descriptors: *Mercury, *Sediments, *Washington, Industrial wastes, Sampling, Analytical techniques, Spectroscopy, Cores, Carbon, On-site data collections, Distribution, Bays, *Path of pollutants, *Pollutant identification, Heavy metals.
Identifiers: Bellingham Bay(Wash).

Cores of undisturbed surface sediment and gravity cores up to 75 cm long were collected from Bellingham Bay in Puget Sound for mercury analysis. Samples of bulk sediments were freeze-dried and analyzed instrumentally by neutron activation utilizing the Hg203 photopeak. Within a sediment core the mercury concentration was generally homogeneous in the top 5 cm probably due to biological and/or tidal mixing of the surface sediment. The mercury concentration decreased rapidly with depth from high values in the upper 5 cm to uniformly low values of less than 0.5 ppm below 15 cm. Surface values decreased with distance away from a major industrial outfall. Total carbon concentrations were measured for the same samples analyzed for mercury. The data suggested that both the carbon content of sedi-

ment and distance from the industrial outfall may be important factors in controlling the distribution of mercury in the surface sediment. There did not seem to be a strong correlation between mercury and total carbon concentrations with depth in the sediment. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06901

THE PHARMACODYNAMICS OF MERCURY AND ITS COMPOUNDS WITH EMPHASIS ON THE SHORT-CHAIN ALKYLMERCURIALS,
Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.
For primary bibliographic entry see Field 5C.
W75-06930

THE HELME-RESERVOIR NEAR KELBRA (KYFFHAEUSER, DDR): III. THE PLANKTON DURING 1967-1970 (IN GERMAN),
Martin Luther-Universitaet, Halle-Wittenberg (East Germany). Hygiene Institut.
For primary bibliographic entry see Field 2H.
W75-06937

PROBABILISTIC METHODS IN STREAM QUALITY MANAGEMENT,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. J. Burges, and D. P. Lettenmaier.
Water Resources Bulletin, Vol 11, No 1, p 115-130, February 1975. 6 fig, 3 tab, 12 ref.

Descriptors: Streams, *Water quality, *Management, *Probability, *Stochastic processes, *Simulation analysis, Dissolved oxygen, Biochemical oxygen demand, Monte Carlo methods, Sampling, Estimating, Equations, Model studies, Temperature, Travel time, Reaeration, Systems analysis, *Risks.
Identifiers: First order analysis, Streeter-Phelps equations, Prediction, Sensitivity analysis.

Recent advances in water quality modelling have shown the need for stochastic models to simulate the probabilistic nature of water quality. However, often all that is needed is an estimate of the uncertainty in predicting water quality variables. First order analysis is a simple method of providing an estimate of the uncertainty in a deterministic model due to uncertain parameters. The method is applied to the simplified Streeter-Phelps equations for DO and BOD; a more complete Monte Carlo simulation is used to check the accuracy of the results. An analysis of the sensitivity of the DO and BOD estimates to varying levels of parameter and input variable uncertainty is given. Results of the uncertainty analyses are discussed in terms of water quality management objectives, and the feasibility of mathematical models for management is assessed. The first order analysis is found to give accurate estimates of means and variances of DO and BOD up to travel times exceeding the critical time. Uncertainty in travel time and the BOD decay constant are most important for small travel times; uncertainty in the reaeration coefficient dominates near the critical time. Uncertainty in temperature is a negligible source of uncertainty in DO for all travel times. (Bell-Cornell)
W75-06946

ON THE EFFICIENT ALLOCATION OF ENVIRONMENTAL ASSIMILATIVE CAPACITY: THE CASE OF THERMAL EMISSIONS TO A LARGE BODY OF WATER,
California Univ., Los Angeles. Dept. of Engineering Systems.
C. R. Scherer.
Water Resources Research, Vol 11, No 1, p 180-181, February 1975. 3 fig, 9 ref.

Descriptors: *Economic efficiency, *Thermal capacity, *Lakes, *Water quality control, *Temperature, Standards, Environment, Heated water, Effluents, Flow rate, Costs, Ports, Size, Cooling towers, Powerplants, Marginal costs, Mathematical models, Systems analysis, Methodology, *Waste assimilative capacity, *Thermal pollution.
Identifiers: Environmental quality, Thermal emissions.

Considered is the economically efficient level of environmental assimilative capacity in the case of thermal electric rejected heat discharges to large lakes subject to temperature standards. A mathematical model relating heated effluent flow rate and 'near-field' temperature is used to determine maximum diffusor port size. Diffusor costs are developed as a function of discharge velocity, port size being given. Cooling tower costs are also developed for comparison with diffusor costs in selecting an optimal level of thermal assimilative capacity. The relationship between this selection process and optimal power plant siting models is outlined. It is shown that arbitrarily fixing discharge velocity at some 'practical' level will tend to bias the results of these siting models toward overly conservative use of thermal assimilative capacity. This means, available capacity will not be fully exploited, and the cost of a given level of power output will be greater than is necessary. (Bell-Cornell)
W75-06950

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS--PHASE III,
Texas Tech Univ., Lubbock. Water Resources Center.
G. B. Thompson, D. M. Wells, R. M. Sweazy, and B. J. Claborn.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 406, $4.25 in paper copy, $2.25 in microfiche. Completion Report WRC-74-2, August, 1974. 56 p, 7 fig, 13 tab, 28 ref. OWRT B-177-TEX(1). 14-31-0001-4130.

Descriptors: *Texas, *Urban runoff, *Water quality, *Storm runoff, Watershed management, Water pollution sources, *Precipitation intensity, *Biochemical oxygen demand, *Chemical oxygen demand, Low flow, Dry seasons, *Storm sewers.
Identifiers: *Lubbock(Tex).

In the 1,499 acre watershed in Lubbock, Texas, thirty-five percent of the total precipitation appeared as direct runoff. From storm to storm, runoff pollutant concentrations varied widely in average and extreme values. COD and BOD washoff from the watershed equaled, respectively, 16.7 and 1.75 pounds/acre-inch of rainfall. There was a continuous, though highly variable, discharge during dry weather from the 26th Street storm sewer, totaling approximately two million gallons per year. Quality of the dry weather flow was considerably poorer than that of untreated domestic sewage. The yearly amount of COD in the dry weather discharge was equal to 15 percent of the mean annual COD in storm runoff. Discharges resulting from efforts to fight major fires contained significant quantities of pollutants. A facility should be constructed to provide interception and storage of the storm sewer discharge. Such a holding pond should trap all dry weather flow, and all flows resulting from unusual events.
W75-06975

BACTERIAL METHANE OXIDATION AND ITS INFLUENCE IN THE AQUATIC ENVIRONMENT,
Ohio State Univ., Columbus. Dept. of Microbiology.
P. R. Dugan, and T. L. Weaver.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 345, $5.75 in paper copy, $2.25 in microfiche. Ohio Water Resources Center, Columbus, Partial Completion Report, August 1974. 133 p, 52 fig, 21 tab, 137 ref. OWRT A-027-OHIO(2).

Descriptors: *Bacteria, *Oxidation, *Methane bacteria, Clays, Methane, Membranes, Enzymes, Soils, Suspended solids, Oxygenation, Water pollution sources.
Identifiers: *Methane oxidation, Cytoplasm.

Suspended clay particles enhance bacterial methane oxidation by decreasing the lag phase of growth, increasing total methane oxidized, and by increasing the rate of methane oxidation. Bacterial methane oxidation enhancement increases with increasing clay concentrations up to 4.0%. The clay types kaolinite, illite, vermiculite, and bentonite equally stimulated bacterial methane oxidation. Clay particles less than 2 micrometers in size elicit a greater stimulation of methane oxidation than particles greater than 2 micrometers in size. The silicious remains of diatoms slightly enhance bacterial methane oxidation. Calcium phosphate and calcium carbonate in suspension almost completely inhibit bacterial methane oxidation. Anacystis nidulans produces an extracellular substance that inhibits bacterial methane oxidation. Chlorella vulgaris and Anabaena variabilis inhibit bacterial methane oxidation when exposed to light. Increased methane utilization rates increase rates of dissolved oxygen composition. Methylosinus trichosporium is one of the bacteria responsible for methane oxidation. A variety of amino acids, organic acids, pentoses, and hexoses enhance methane oxidation by this bacterium. The bacterium fixes about 50% of the methane it oxidizes into cell material and one oxygen atom is consumed at each oxidative step during methane oxidation which is consistent with a monooxygenase. Intracytoplasmic membranes are organelles of electron transport and energy entrapment in this bacterium; methane is fixed into cell material by the cytoplasmic enzyme serine hydroxymethyl transferase. The bacterium has a specific formaldehyde dehydrogenase in the cytoplasm. ATPase was observed in both cytoplasm and membranes.
W75-06987

STUDIES ON THE HYDROLYSIS AND PRECIPITATION OF ALUMINUM (III),
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-06988

CIRCULATION IN SHALLOW ESTUARIES,
Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-07030

MATHEMATICAL MODELLING OF WATER QUALITY IN A RIVER SYSTEM,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
J. D. Lawson, and R. J. Vass.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 401-414, (1973). 6 fig, 29 ref.

Descriptors: *Path of pollutants, *Model studies, *Water quality, *Rivers, *Effluents, Dissolved oxygen, Biochemical oxygen demand, Mathematical models, Simulation analysis, Pollutants, Water pollution, Thermal pollution, Powerplants, Watersheds(Basins), *Australia.
Identifiers: *Latrobe River(Australia).

The concepts related to the development of a mathematical simulation model for the Latrobe River Basin in Victoria, Australia, were investigated. The relevant parameters affecting natural stream purification, their interdependence, and the subsequent development of suitable mathematical equations were outlined. The model comprises a series of cells each of which is assumed to contain fully mixed water. Effluents are

introduced as point sources. Account is taken of the conservative or decaying nature of the effluent. The unsteady nature of fresh water throughout may be reproduced from hydrological records. A case study of the Latrobe River was presented. Historical records for water quality were reproduced together with the results of simulation studies in the river for biochemical oxygen demand and dissolved oxygen deficit. The problem of obtaining reliable and sufficient data was also considered. (See also W75-06998) (Sims-ISWS)
W75-07031

MATHEMATICAL MODELS FOR THE PLANNING AND MANAGEMENT OF THE SAINT JOHN RIVER SYSTEMS,
Department of the Environment, Ottawa (Ontario). Ecological Systems Research Div.
A. K. Biswas, and P. J. Reynolds.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 415-428, (1973). 5 fig, 10 ref.

Descriptors: *Model studies, *Water quality, *Rivers, *Effluents, Dissolved oxygen, Biochemical oxygen demand, Mathematical models, Computer programs, Simulation analysis, Linear programming, Pollutants, Water pollution, Management, Comprehensive planning, Watersheds(Basins), *Canada.
Identifiers: *Saint John River(Canada).

Models add one more dimension to the decision-making process by better understanding of the system in consideration, by broadening of the information base, by predicting the consequences of several alternative courses of action, and by selecting a suitable course of action which will accomplish a prescribed result. For the Saint John River System in Canada, two complementary models were developed: a linear programming model for the preliminary screening of alternative designs and operating policies to be followed by a simulation model for more detailed analyses of select few designs and operating policies. The development and use of these two models were discussed as planning and management tools for the Saint John River Basin. (See also W75-06998) (Sims-ISWS)
W75-07032

MATHEMATICAL MODELLING FOR SHORT-TERM TRANSPORT IN VERTICALLY MIXED ESTUARIES,
Madras Univ., Guindy (India). Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 2L.
W75-07033

CHARACTERISTICS OF THE INTERFACIAL REGION OF A TWO-LAYER FLOW SYSTEM,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-07034

A MATHEMATICAL MODEL TO PREDICT DISCHARGE VARIATIONS IN AN ESTUARY WITH SHALLOW WATER AND A LARGE TIDAL RANGE,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).
For primary bibliographic entry see Field 2L.
W75-07035

FINITE ELEMENT NUMERICAL MODELLING OF FLOW AND DISPERSION IN ESTUARIES,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-07036

THE INTERACTION OF VELOCITY DISTRIBUTION AND SUSPENDED LOAD IN TURBULENT STREAMS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 2J.
W75-07039

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. VI, SIMULATION, OBSERVATION, AND STATE ESTIMATION,
New York City-Rand Inst., N.Y.
J. J. Leendertse, and S-K. Liu.
Report R-1586-NYC, September 1974. 103 p, 69 fig, 1 tab, 9 ref, 4 append.

Descriptors: *Model studies, *Water quality, *Urban runoff, *Estuarine environment, Computer models, Overflow, Pollutants, Storm runoff, Storm drains, Urban drainage, Coliforms, Sewage bacteria, Bays, Estuaries, Tides, Simulation analysis, New York.
Identifiers: *Jamaica Bay(NY), *New York City.

The water-quality simulation of post-rainstorm coliform bacteria distributions in Jamaica Bay, New York was described by use of models of the drainage basins surrounding the bay and a water-quality simulation of the bay itself. A stochastic analysis method was introduced into the investigation to assess the behavior and resolving power of the water-quality simulation model and to derive an optimal estimate of missing input data. The estimates obtained by simulation agree well with those obtained by field measurements, except near Bergen Basin where an unknown source of coliform bacteria exists. The origin and extent of this input should be determined from new field surveys. Since the response to a rainstorm of all major components of this urban estuarine system can be determined, the models described provide the basis for the optimal design and management of an auxiliary treatment system for sewer overflows of the drainage basins around the bay. (Sims-ISWS)
W75-07042

GROUNDWATER OF SOUTHEASTERN VIRGINIA.
Virginia State Water Control Board, Richmond. Bureau of Water Control Management.
For primary bibliographic entry see Field 4B.
W75-07044

ACID PRECIPITATION IN THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, N.Y. Section of Ecology and Systematics.
C. V. Cogbill, and G. E. Likens.
Water Resources Research, Vol 10, No 6, p 1133-1137, December 1974. 5 fig, 1 tab, 32 ref.

Descriptors: *Air pollution, *Precipitation(Atmospheric), *Acidic water, *Water pollution sources, Water pollution, Pollutants, *Path of pollutants, Acids, *Northeast U.S., Anions, Cations, Industrial wastes, Hydrogen ion concentration, Pollutant identification.
Identifiers: Acid precipitation.

Analysis of recent precipitation samples from the northeastern United States showed a consistent pH of less than 4.4, when the expected pH based upon equilibrium with CO2 would be 5.6. A stoichiometric formation process being assumed, some 65% of the acidity is due to H2S04, 30% to HN03, and less than 5% to HC1. The pH values may be predicted from chemical content and generally agree to within 0.1 pH unit with the observed pH. The distribution of acid precipitation encompasses most of the northeastern United States. This pattern apparently has existed since about 1950-1955, but the intensity of acid deposition, especially that due to HN03, has increased since then. Analysis of prevailing winds indicated that much of the acidity originates as a general source over industrial areas in the Midwest. (Sims-ISWS)
W75-07057

CHEMICAL ANALYSIS FOR EVALUATION OF SOIL SORPTION PROPERTIES,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
G. D. Zarnett.
Research Paper S2040, October 1974. 18 p, 1 fig, 4 ref.

Descriptors: *Chemical analysis, *Soils, *Adsorption, Sampling, Moisture content, Salts, Phosphates, Ion exchange, Sorption, Analytical techniques, Pollutants, Waste water treatment, Soil disposal fields, Septic tanks, Tile drains, *Path of pollutants.

The movement of contaminants through soil poses a major difficulty in the design and planning of private waste treatment systems. The problems connected with waste treatment by tile field systems require knowledge of the capacity or degree of uptake of specific contaminants by the soil, the effect of concentration, and the rate of movement. Analyses and techniques were described which will be useful in evaluating the capabilities of soils for contaminant removal. The soil adsorption isotherm determination is the most informative for determining soil capacities for single and multi species systems and the concomitant effects of varying concentration. The rate of contaminant movement can then be calculated with the use of the isotherm parameters. (Sims-ISWS)
W75-07058

CRUDE OIL SPILLS, DISAPPEARANCE OF AROMATIC AND ALIPHATIC COMPONENTS FROM SMALL SEA-SURFACE SLICKS,
Argonne National Lab., Ill.
W. Harrison, M. A. Winnik, P. T. Y. Kwong, and D. Mackay.
Environmental Science and Technology, Vol 9, No 3, p 231-234, March 1975. 1 fig, 13 ref.

Descriptors: *Path of pollutants, *Oil spills, Oceans, *Weathering, *Aromatic compounds, Mathematical models, Model studies, On-site investigations, *Oil pollution, *Oil wastes, Oily water, Evaporation.

Experimental data were presented for the weathering of five small (1.04 cu m) ocean spills of South Louisiana crude oil. The oil was spiked with cumene and the concentrations of cumene and several alkanes were measured for up to 5 hr after the spill. Comparison of the rates of loss of cumene and nonane, which have similar volatilities but different solubilities, was made in an attempt to quantify the relative rates of evaporation and dissolution. An approximate model of the evaporation-dissolution process was derived which suggests that cumene is lost principally by evaporation. The effects of whitecapping and the existence of different weathering rates in the same spill were described. (Sims-ISWS)
W75-07064

DISPERSION OF FLOATABLES IN LAKE CURRENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W75-07068

SUMMARY AND ANALYSIS OF PHYSICAL OCEANOGRAPHY DATA COLLECTED IN THE NEW YORK BIGHT APEX DURING 1969-70,
National Oceanic and Atmospheric Administration, Boulder. Colo. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 2L.
W75-07069

RESEARCH NEEDS RELATED TO HYDROMETEOROLOGIC ASPECTS OF FUTURE ENERGY PRODUCTION,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 6D.
W75-07094

RESEARCH NEEDS RELATED TO HEAT DISSIPATION FROM LARGE POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, and J. F. Kennedy.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign, Research Report No. 93, p 111-133, November, 1974. 1 fig, 1 tab, 33 ref.

Descriptors: Water resources, *Water requirements, *Energy conversion, *Thermal pollution, *Water cooling, *Cooling towers, *Research priorities, Environmental effect, Economic impact, Power plants, Lakes.
Identifiers: *Cooling ponds, Spray cooling, Once-through cooling, Closed cycle cooling.

As demand for electrical power continues to increase, the power industry is attempting to meet these needs by building more and larger power plants. Operating with large thermal inefficiencies, great amounts of waste heat were generated and discarded in natural water bodies. Due to recent legislation which reqires cooling methods to circumvent the natural water sources, other means for transferring heat directly to the atmosphere and/or into space have been developed. Cooling towers, cooling ponds and lakes, spray cooling and once-through cooling are described briefly with corresponding research needs outlined. Design criteria and procedures of open-cycling cooling (once-through), cheapest and most environmentally damaging, are explained. Because of recent legislation, once-through cooling will be used in the future only where it can be demonstrated convincingly that no adverse environmental impact will be produced. Research will be needed on problems arising from economic, thermodynamic and human factors of alternative methods. Cooling ponds and lakes are being considered as alternatives. Heat rejection rates depend upon pond temperature, area depth, air temperature, wind speed, overall heat exchange factors and other factors. Studies for heat balance considerations are cited. Research needs are summarized for cooling lakes and ponds, spray cooling, and cooling towers (in terms of physical data), systems relationships models, economic assessment (cost-benefit analyses) and the measurement of indirect effects (social, political). Research is needed to make selection of a combination of the above processes integrating the design with economic-thermodynamic studies. (See also W75-07089) (Salzman-North Carolina)
W75-07095

STUDY OF TRACE ELEMENTS IN WATERS OF TWO ALASKAN RESERVOIR SITES,
Alaska Univ., College. Inst. of Water Resources.
D. W. Smith, and M. J. Hayes.
vailable from the National Technical Information Service, Springfield, Va 22161 as PB-241 470, $4.75 in paper copy, $2.25 in microfiche. Alaska Institute of Water Resources, Fairbanks, Report No. IWR-57, January, 1975. 82 p, 39 fig, 14 tab, 75 ref. OWRT A-044-ALAS(1).

Descriptors: *Alaska, *Reservoir sites, *Trace elements, *Metals, Reservoirs, Water sampling, Spectroscopy, Calcium, Iron, Cadmium, Chromium, Copper, Manganese, Nickel, Cobalt, Zinc, Impoundments, *Reservoir construction, *Reservoir design, *Pre-impoundment, Water pollution sources, Water quality.
Identifiers: *Ship Creek reservoir(Alas), Monashka Creek reservoir(Alas).

The occurrence of trace metals in the waters of Ship and Monashka Creeks reservoirs in Alaska was investigated. Water samples have been collected over a period from late March through mid-October, 1974. The samples have been analyzed for fourteen biologically important metals using both flame and flameless atomic absorption spectroscopy. Ship Creek has greater concentrations of calcium, iron, potassium, zinc, cadmium, cobalt, copper, and nickel than does Monashka Creek. The concentrations of most of these elements are greater in water from the lower regions of the Ship reservoir than in the influent waters. The level of cadmium in Ship Creek reservoir (and iron and manganese during some seasons of the year) exceeds the tolerance limit for water supplies set by the US Public Health Service. Although the concentrations of metals in Monashka Creek are usually low, there is some indication that iron and manganese levels may exceed the US Public Health Service's recommended levels in some seasons. Concentration of these metals will increase due to the lack of clearing prior to impoundment. If a larger impoundment is constructed at Ship Creek, the problems associated with increased metal concentrations may become severe. Reservoir clearing, multiple outlets, and aeration systems should be considered in the design and construction of such a structure. Since the waters of Monashka Creek were impounded prior to clearing, a system of multiple outlets or an aeration system should be considered in the final design to minimize treatment costs.
W75-07100

THE LIMNOBIOLOGY OF DEVILS LAKE CHAIN, NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Biology.
J. K. Neel.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 460, $3.25 in paper copy, $2.25 in microfiche. Research Report No. WI-221-026-74, November, 1974. 17 p, 1 fig, 5 tab, 4 ref. OWRT A-026-NDAK(1).

Descriptors: *Water quality control, *Lakes, *North Dakota, *Phytoplankton, *Limnology, Biota, Lake basins, Benthos, Cyanophyta.
Identifiers: *Lake restoration, Limnobiology(Lakes), *Devils Lake(NDak).

The two lakes isolated from general surface runoff had highest mineral concentration and least varied biotas. Increased runoff into the chain (1969-1972) has so far increased volume only in Devils Lake where dilution of dissolved compounds and mineral pickup from dried lake beds have both occurred. There was no shortage of phosphorus and nitrogen in the system, and phosphorus availability was noted over wide areas, including groundwater, almost simultaneously in 1972. Phytoplankton was dominated by blue-green algae except in the Stump Lakes. Benthos of East Stump consisted of two salt tolerant forms, but that of West Stump contained groups common to the general area except molluscs. Volume restoration to date has improved water quality in affected areas and benefited fish, wildlife, and recreational resources.
W75-07102

DISTRIBUTION AND ECOLOGY OF RIVER MOLLUSKS IN CENTRAL AND WESTERN NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
A. M. Cvancara.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 473, $3.25 in paper copy, $2.25 in microfiche. Research Report No. WI-221-029-75, January, 1975. 5 p, 3 ref. OWRT A-013-NDAK(1).

Descriptors: *Mollusks, Ecology, *North Dakota, Water quality, Clams, *Snails, Distribution, *Bioindicators, Water pollution.
Identifiers: *Pill clams, Souris River(NDak).

At least 44 species of aquatic mollusks inhabit North Dakota--13 mussels, 9 pill clams and 22 snails--and most of these can be found in the central and western parts of the state (except for the Red River Valley in the eastern part of the state). The most frequently occurring mussel, pill clam, and snail are Anodonta grandis Say, Pisidium compressum Prime, and Physa gyrina Say. These mollusks are distributed within three molluscan provinces in the state: Northeastern, Intermediate and Southwestern. The Intermediate province (corresponding to the Missouri Coteau) trends northwest through the central part of the state and contains 23 species. The Northeastern and Southwestern provinces contain 41 and 26 species. Individual species distributions are cosmopolitan, sporadic or restricted. Ecological factors limiting the occurrence of one or more groups of mollusks are: (1) size and relative permanency of water body; (2) bottom instability; (3) possibly high turbidity; (4) possibly high total chlorides; (5) high total sulfates; (6) lack of suitable fish (for mussels only); and, (7) man's activities, such as alteration or destruction of habitat, drainage changes, and water pollution. Mollusks can serve as useful biological indicators of poor water quality and they suggest a pollution problem on the Souris River downstream from the city of Minot.
W75-07105

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. I PIGMENTS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
R. Ikan, Z. Aizenshtat, M. J. Baedecker, and I. R. Kaplan.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-30838, $3.75 in paper copy, $2.25 in microfiche. Publication 1243, (1974). 27 p, 8 fig, 2 tab, 36 ref.

Descriptors: Marine geology, *Analytical techniques, *Sediments, *Pigments, *Organic matter, Analysis, Chromatography, Mass spectrometry, Evaluation, Instrumentation, Continental shelf, Sedimentation, *California, Organic compounds, Spectroscopy, Chlorophyll, Lipids, Solvent extractions, Photosynthesis.
Identifiers: *Tanner Basin(Calif), *Carotenes, Chlorins, Alpha-ionene, Prophyrins, Bandaras Bay, Carotenoids.

Sediment from Tanner Basin, the outer continental shelf off southern California, was analyzed for photosynthetic pigments and their derivatives, namely carotines and chlorins. Samples of the sediment were also exposed to raised temperatures (65C, 100C, 150C) for various periods of time (1 week, 1 month, 2 months). Analysis of the heat-treated sediment revealed the presence of alpha-ionene and 2,6-dimethylnapthalene, thermal-degradation products of beta-carotene. Chlorins were converted to nickel porphyrins of both DPEP and etio series. Possible mechanisms of these transformations were presented. (See W75-07168 and W75-07169) (Henley-ISWS)
W75-07167

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. II ISOPRENOIDS,
California Univ., Los Angeles. Dept. of Geophysics and Planetary Physics.
R. Ikan, M. J. Baedecker, and I. R. Kaplan.

Available from the National Technical Information Service, Springfield, Va 22161 as N74-30839, $3.75 in paper copy, $2.25 in microfiche. Publication 1244, (1974). 20 p, 3 fig, 2 tab, 31 ref.

Descriptors: *Sediments, *Organic matter, *Analytical techniques, Marine geology, *Organic compounds, Chromatography, Mass spectrometry, Evaluation, Instrumentation, Sedimentation, *California, Spectroscopy, Solvent extractions, Continental shelf, Chlorophyll, Analysis, Marine biology, Organic wastes.
Identifiers: *Isoprenoids, *Tanner Basin(Calif), Hexane, Benzene, Methanol, Phytol, Chlorins, Ketone, Phytanic acid, Pristanic acid.

A series of isoprenoid compounds were isolated from a heat-treated marine sediment (from Tanner Basin) which were not present in the original sediment. Among the compounds identified were: phytol, dihydrophytol, C sub 18-isoprenoid ketone, phytanic and pristanic acids, C sub 19- and C sub 20-monoolefines, and the alkanes pristane and phytane. The significance and possible routes leading to these compounds were discussed. (See also W75-07167) (Henley-ISWS)
W75-07168

THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. III ALIPHATIC AND STEROIDAL ALCOHOLS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
R. Ikan, M. J. Baedecker, and I. R. Kaplan.
Publication 1245, (1974). 24 p, 1 fig, 4 tab, 28 ref.

Descriptors: *Organic matter, *Sediments, Marine geology, *Analytical techniques, *Alcohols, Chromatography, Mass spectrometry, Evaluation, Instrumentation, Sedimentation, *California, Organic compounds, Spectroscopy, Solvent extractions, Continental shelf, Analysis, Chemicals, Organic wastes, Marine biology, Carbon.
Identifiers: *Tanner Basin(Calif), *Aliphatic alcohols, Bandaras Bay(Calif), Isoprenoids, Sterols, Stanols.

Recent sediments from Tanner Basin and Bandaras Bay were analyzed for normal, isoprenoid, and steroidal alcohols by using chromatographic (column, GLC, TLC), and spectroscopic (UV, IR, MS) methods prior to and after heat-treatment (from 65 to 150C). Normal saturated alcohols (C sub 14-C sub 24) and some monounsaturated alcohols were identified as well as the isoprenoid alcohols phytol and dihydrophytol. Two series of sterols Delta (5) and Delta (7) were found in Tanner Basin sediment, and Delta (5)-sterols and triterpenes in Bandaras Bay sediment. Sterols from both sediments also contained the corresponding stanols. GLC and MS study of branched-cyclic hydrocarbons revealed the presence of steranes and sterenes (intermediates in sterane formation). (See also W75-07167) (Henley-ISWS)
W75-07169

AN APPLICATION OF THE METHOD OF CHARACTERISTICS TO TIDAL CALCULATIONS IN (X-Y-T) SPACE,
University of Strathcylde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-07182

WATER QUALITY DIMENSIONS OF WATER RESOURCES PLANNING,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 5G.
W75-07185

GEOCHEMICAL ANALYSIS OF STREAM SEDIMENTS AS A TOOL FOR ENVIRONMENTAL MONITORING: A PIGYARD CASE STUDY,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 5A.
W75-07188

SEASONAL NITRATE CYCLING AS EVIDENCE FOR COMPLETE VERTICAL MIXING IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W75-07198

PRINCIPAL-COMPONENT ANALYSIS OF STREAMFLOW CHEMICAL QUALITY DATA,
Geological Survey, Reston, Va.
T. D. Steele, and N. C. Matalas.
In: Mathematical Models in Hydrology; Proceedings of Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No 100, p 355-363, 1974. 1 fig, 4 tab, 6 ref.

Descriptors: *Water quality, *Statistics, *Variability, Water chemistry, Correlation analysis, Water pollution sources, Pollutant identification.
Identifiers: *Principal component analysis.

Principal components were computed from various matrix combinations of annual mean concentrations of the major solutes in streamflow. For data from eight sampling stations in the United States with periods of records extending from 20 to 30 years, between 56 and 84 percent of the variability of the major ions was explained by the first principal component, and an additional 12 to 34 percent was explained by the second principal component. Annual mean specific conductances correlated highly with the first principal component, indicating that conductance may serve as an index reflecting the variability inherent in salinity conditions in streamflow. Additional sensitivity analysis was carried out to evaluate the effect on the first principal component of dropping one or two relatively minor chemical constituents from the data correlation matrix from which the principal components were derived. (Knapp-USGS)
W75-07200

GROUND-WATER QUALITY BENEATH SOLID-WASTE DISPOSAL SITES AT ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
C. Zenone, D. E. Donaldson, and J. J. Grunwaldt.
Ground Water, Vol 13, No 2, p 182-190, March-April 1975. 8 fig, 2 tab, 9 ref.

Descriptors: *Alaska, *Landfills, *Water pollution sources, *Path of pollutants, Hydrogeology, Water table, Water quality, Waste disposal, Garbage dumps.
Identifiers: *Anchorage(Alaska).

At three solid-waste disposal sites in the Anchorage areas of Alaska, differences in local geohydrologic conditions influence groundwater quality. Leachate was detected in groundwater within and beneath two sites where the water table is very near land surface and refuse is deposited either at or below the water table in some parts of the filled areas. No leachate was detected in groundwater beneath a third site where waste disposal is well above the local water table. (Knapp-USGS)
W75-07204

INVESTIGATING GROUND-WATER POLLUTION FROM INDIANAPOLIS' LANDFILLS--THE LESSONS LEARNED,
Geological Survey, Indianapolis, Ind.
W. G. Weist, Jr., and R. A. Pettijohn.
Ground Water, Vol 13, No 2, p 191-196, March-April 1975. 2 fig, 5 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Landfills, *Indiana, *Groundwater, Sampling, Water wells, Test wells, Observation wells, Monitoring.
Identifiers: *Indianapolis(Ind).

In Indianapolis, the nature and extent of water pollution resulting from the operation of seven landfills in or near the city was studied using 10 to 36 observation wells, ranging from 14 to 170 feet deep, installed in and around each landfill. After the wells were completed and developed, water samples were collected from selected wells for detailed chemical analysis. Every month the water levels are measured and field determination of four chemical and physical water parameters are made. (Knapp-USGS)
W75-07205

MONITORING REGIONAL EFFECTS OF HIGH PRESSURE INJECTION OF INDUSTRIAL WASTE WATER IN A LIMESTONE AQUIFER,
Geological Survey, Tallahassee, Fla.
G. L. Faulkner, and C. A. Pascale.
Ground Water, Vol 13, No 2, p 197-208, March-April 1975. 7 fig, 2 tab, 13 ref.

Descriptors: *Path of pollutants, *Florida, *Waste disposal wells, *Injection wells, *Monitoring, Industrial wastes, Aquifers, Artesian aquifers, Limestones, Hydrogeology, Water pollution sources.
Identifiers: *Pensacola(Fla).

More than 10 billion gallons of acid industrial waste has been injected under high pressure into a saline-water-filled part of a limestone aquifer of low transmissivity 1,400 feet below land surface near Pensacola, Florida. A similar waste disposal system is planned for the same zone at a site about 8.5 miles to the east. The injection zone is the lower limestone of the Floridan aquifer. The lower limestone is overlain by a confining layer of plastic clay at the injection site and underlain by another confining layer of shale and clay. The injection system consists of two injection wells about a quarter of a mile apart and three monitor wells. Three more monitor wells in the injection zone activated in early 1974 at sites 17 miles northeast, 22 miles east and 33 miles northeast of the injection site. No change in pressure or water quality due to injection was, by mid-1974, evident in the upper limestone at the injection site, but static pressures in the lower limestone at the site has increased 8-fold since injection began in 1963. Diluted waste arrived at the south monitor well in 1973. By mid-1974 pressure effects from waste injection were calculated to extend radially more than 40 miles from the injection site. No effects were measured at the well 33 miles away. Less than 20 miles northeast of the active injection site, the lower limestone contains fresh water. Changes in the pressure regime due to injection indicate a tendency for northeastward movement of the freshwater/salt-water interface in the lower limestone. (Knapp-USGS)
W75-07206

GROUND-WATER CONTAMINATION IN THE SILURIAN DOLOMITE OF DOOR COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
M. G. Sherrill.
Ground Water, Vol 13, No 2, p 209-213, March-April 1975. 6 fig, 11 ref.

Descriptors: *Water pollution sources, *Groundwater, *Wisconsin, *Septic tanks, *Industrial wastes, Karst, Dolomite, Path of pollutants, Hydrogeology.
Identifiers: *Door County(Wis).

Door County, a recreational and fruit-growing area bordering Lake Michigan in northeastern Wisconsin, has had a long history of groundwater contamination from surface and near-surface sources. Contamination is most severe in late summer when the influx of tourists and fruit-canning operations create additional wastes. Thin soil cover and well-fractured dolomitic bedrock give easy entry to groundwater contaminants throughout large parts of Door County. Many contaminants enter the dolomite by surface or near-surface seepage. There is little attenuation of contamination concentrations in the well-jointed dolomite, and contaminants may travel long distances underground in a relatively short time. The major source of groundwater contamination is bacterial, from individual waste-disposal systems, agricultural, industrial, and municipal sources. The contaminated areas include only a small percentage of the total groundwater system and are separated by large areas of groundwater free of contamination. Tests based on indicator bacteria suggest that the periods of highest contamination potential occur during or immediately following rapid groundwater recharge periods. Increasing the depth of casing and pressure grouting the casing into firm bedrock are two well-construction procedures that reduce the contamination potential in wells. (Knapp-USGS)
W75-07207

HYDROLOGIC- AND SALT-BALANCE INVESTIGATIONS UTILIZING DIGITAL MODELS, LOWER SAN LUIS REY RIVER AREA, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. A. Moreland.
Available from NTIS, Springfield, Va 22161 as PB-239 697/As, $4.25 in paper copy, $2.25 in microfiche. Water Resources Investigations 24-74, October 1974. 66 p, 19 fig, 8 tab, 14 ref.

Descriptors: *Water balance, *Salinity, *Path of pollutants, *Mathematical models, *California, Planning, Groundwater basins, Hydrologic budget, Groundwater movement, Water management(Applied), Water quality, Watershed management.
Identifiers: *San Luis Rey River(Calif), *San Diego County(Calif).

Hydrologic and salt balances were computed for the Pauma, Pala, Bonsall, and Mission groundwater basins of the San Luis Rey River watershed, California. Hydrologic budgets were tested for compatibility with known hydrologic parameters by constructing and verifying near-steady-state and transient-state models. Near-steady-state inflow and outflow were calculated to be 3.7 cubic hectometres per year for Pauma basin, 3.1 cu hm per year for Pala basin, 6.6 cu hm per year for Bonsall basin, and 8.3 cu hm per year for Mission basin. In 1972 annual net difference between inflow and outflow was -2.8 cu hm per year for Pauma, -1.0 cu hm for Pala, +0.1 cu hm per year for Bonsall, and +1.5 cu hm per year for Mission. Salt-balance calculations for 1972 indicate that salt inflow exceeded salt outflow by 2,000 tonnes per year in Pauma basin, 640 tonnes per year in Pala basin, 2,400 tonnes per year in Bonsall basin, and 3,800 tonnes per year in Mission basin. (Knapp-USGS)
W75-07212

CHEMICAL AND BIOLOGICAL QUALITY OF LAKE DICIE AT AUSTIS, FLORIDA, WITH EMPHASIS ON THE EFFECTS OF STORM RUNOFF,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5C.
W75-07213

HYDROLOGY OF THE OKLAWAHA LAKES AREA OF FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-07220

A WASTE ASSIMILATIVE CAPACITY MODEL FOR A SHALLOW, TURBULENT STREAM,
Marquette Univ., Milwaukee, Wis.
V. Novotny, and P. A. Krenkel.
Water Research, Vol 9, No 2, p 233-241, 1975. 9 fig, 1 tab, 16 ref.

Descriptors: *Mathematical models, *Nitrification, *Oxygen requirements, *Reaeration, *Waste assimilative capacity, *Water quality, Dissolved oxygen, Waste water treatment, Water pollution control, *Tennessee, Model studies, Streams.
Identifiers: *Holston River(Tenn).

A mathematical water quality model (DOSAGI) for self-purification of small streams was modified and applied for the waste assimilative capacity determination of a shallow turbulent stream in Tennessee. The model is a steady state dissolved oxygen balance model which solves simultaneously the three basic equations for deoxygeneation, nitrification, and dissolved oxygen concentration. Verification of the model, with the data from two water quality surveys, demonstrated that the model can be successfully applied (excluding the effect of photosynthesis by aquatic weeds). The model requires determination of deoxygenation and degree of treatment. The solution matrix includes temperature, the deoxygenation coefficient, streamflow, wastewater loads, stream depth, and the reaeration coefficient as vectors for the waste assimilative capacity determination. (Harmeson-ISWS)
W75-07268

MICROBIAL TRANSFORMATIONS OF MERCURY IN AQUATIC ENVIRONMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. E. Sommers, and M. Floyd.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-241 486, $4.75 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Lafayette, Technical Report No. 54 December 1974. 80 p, 8 fig, 20 tab, 76 ref. OWRT A-023-IND (1).

Descriptors: *Mercury, *Aquatic microorganisms, *Lake sediments, Analytical techniques, Water pollution sources, Sediments, Sediment-water interfaces, Microbiology, *Pollutant identification.
Identifiers: *Alkylmercury, *Monoalkylmercury, *Flameless atomic absorption.

A procedure was developed for determining total mercury in soils and sediments. Also a simple steam distillation - flameless atomic absorption procedure was developed and evaluated for extraction and quantitation of organic mercury in sediments. Experiments were conducted to determine the fate of mercuric chloride and methyl mercuric chloride in lake sediments incubated under laboratory and field conditions. The results indicated that CH_3Hg^+ is unstable in sediments and may be converted into dialkylmercury or possibly Hg^{2+}. The necessity for microbial activity in mercury transformations was established using sediments sterilized with autoclaving or by exposure to gamma radiation. The rates of mercury conversions were enhanced by increasing temperatures, amending sediments with organic carbon, and increasing mercury concentrations. The field study indicated that nonalkylmercury can be formed under natural conditions and that CH_3Hg^+ introduced into sediments may be degraded. In general, the rates for mercury transformations were greater under laboratory conditions than during in situ incubation.
W75-07275

WATER QUALITY MODEL OF THE LOWER FOX RIVER, WISCONSIN,
Environmental Protection Agency, Washington, D.C. Office of Enforcement and General Counsel.
D. Crevensten, A. Stoddard, and G. Vajda.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-230 269, $4.25 in paper copy, $2.25 in microfiche. Report EPA-905-73-001, August 1973. 68 p, 10 fig, 9 tab, 17 ref.

Descriptors: Rivers, *Water pollution control, *Model studies, *Dissolved oxygen, Municipal wastes, Pulp wastes, Sewage treatment, Computer programs, Biochemical oxygen demand, Water quality standards, Forecasting, *Lake Michigan, *Wisconsin.
Identifiers: *Fox River(Wis), Green Bay(Lake Michigan).

Gross water pollution has existing in the Lower Fox River and Green Bay, Wisconsin, for a number of years. Concentrated in this basin are eight urban areas and nineteen pulp and paper manufacturers that make intensive use of the river for disposal and assimilation of wastes. The lower river, approximately 40 miles long, flows northeasterly through a series of 18 locks and dams. A mathematical model describing the interrelationship between the dissolved oxygen concentration of a river and its various sources and sinks has been adapted for use in a study of the river. The analysis assumes a steady-state condition and describes the longitudinal distribution of dissolved oxygen from Neenah-Menash to Green Bay, a distance of approximately 40 miles. The model was verified for various conditions of waste loading, river temperature, and river flow. It was then used to evaluate the implementation of interim best practicable control technology on effluent limitations for industrial dischargers and 90% BOD removal from municipal waste sources, as an estimate of treatments levels. The study indicated that implementation of the effluent limits will result in significant improvement of water quality. (Jones-Wisconsin)
W75-07327

THE NITROGEN-TO-PHOSPHORUS RATIO IN THE PHOTIC ZONE OF THE SEA AND THE ELEMENTAL COMPOSITION OF PLANKTON,
Washington Univ., Seattle, Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W75-07328

THE BOD5/DO RATIO. A NEW ANALYTICAL TOOL FOR WATER QUALITY EVALUATION,
Environmental Protection Agency, Philadelphia, Pa. Region III.
For primary bibliographic entry see Field 5A.
W75-07329

THE FATE AND BEHAVIOR OF CRUDE OIL ON MARINE LIFE,
Massachusetts Univ., Gloucester. Marine Station.
For primary bibliographic entry see Field 5C.
W75-07339

5C. Effects Of Pollution

BACTERIAL DEGRADATION OF ARYLSULFONATES IN TREATMENT OF WASTEWATER,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W75-06852

INTERRELATIONSHIPS OF VARIOUS BIOASSAY PROCEDURES FOR PULP AND PAPER EFFLUENTS,
B.C. Research, Vancouver (British Columbia).

C. C. Walden, D. J. McLeay, and D. D. Monteith. Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974. Preprinted Proceedings (Montreal, P.Q.), p 1-8, 11 fig, 3 tab, 16 ref.

Descriptors: *Bioassay, *Pulp wastes, *Toxicity, *Water analysis, Water pollution sources, Pulp and paper industry, Fish, Water pollution effects, Wastes, Industrial wastes, Analytical techniques, Water quality standards, Storage, Stability, Anaerobic conditions, Legislation, Fishkill, Water pollution, Temperature, Water quality, Water temperature, Water properties.

Bioassay procedures for pulp and paper mill effluents were investigated in order to develop a method which measures only inherent toxicity. This procedure was used to establish relationships between various current procedures and regulatory requirements. Flow-through solution replacement and complete physical exchange of the solutions in the same time interval were shown to be equivalent. Maximum stability of toxicity in bioassay solutions was achieved by solution replacement every 24 hr, where exposure periods were 72 hr or longer, and fish loading was 0.5 g/liter. With exchange every 12 hr, fish loadings up to 2 g/liter could be accommodated with minimal loss in toxicity, even for shorter-term exposures. Storage with complete exclusion of air is the most important safeguard for stabilizing sample toxicity. Storage at low temperatures achives little more, except where anaerobiosis may occur. The toxicity of some samples during storage presented an anomalous behavior. The conversion into toxic units provided a basis for direct comparison of bioassay data. Examination of regulatory requirements showed that the present Federal legal requirement is about twice as stringent as the static monitoring bioassay and other regulatory guidelines. Monitoring bioassay procedures, with exposure times of 24 or 48 hr, can be designed which have the same sensitivity for measuring effluent toxicity as the present gamut of regulatory procedures, and are considerably simpler. (Witt-IPC)
W75-06867

POLLUTIONAL EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND.
Washington State Pollution Control Commission (Olympia, Wash.), 503 p, March, 1967.

Descriptors: *Pulp wastes, *Water pollution effects, Organizations, Industrial wastes, Wastes, Water pollution sources, Pulp and paper industry, Waste water(Pollution), Effluents, Water quality, Dispersion, Surface waters, Pacific Northwest U.S., *Washington, Aquatic life, On-site tests, Laboratory tests, Analytical techniques, Water pollution control, Water pollution treatment, Waste water treatment, Water analysis, Water pollution, Sulfite liquors.
Identifiers: *Puget Sound(Wash).

This report presents the work and findings of a cooperative study by the Washington State Pollution Control Commission and the Federal Water Pollution Control Administration on the pollutional effects of pulp and paper mill effluents in Puget Sound. The effluents are discharged by 7 pulp and paper mills (6 sulfite pulp, paper, and paperboard mills and 1 kraft pulp and paper mill) located at Bellingham, Anacortes, Everett, and Port Angeles, Washington. The comprehensive study program consisted of in-plant surveys to determine the amounts and characteristics of the wastes discharged; waste distribution and water quality studies to determine the transport and dispersion of mill wastes in the receiving stream and to assess their effects on water quality; and biological studies to determine the effects of the dispersed wastes and degraded water quality on marine life. Methods and procedures employed in many of the field and laboratory studies are described briefly. The major findings of the studies are summarized and recommendations are made on how to reduce or eliminate pollution from each of the mills. (Witt-IPC)
W75-06881

WOODY SOLIDS DISCHARGED INTO WATER COURSES BY THE FOREST PRODUCTS INDUSTRY.
Paperi ja Puu, Vol 56, No 12, p 1013-1016, 1019-1025, December, 1974. 6 fig, 1 tab, 7 ref.

Descriptors: *Wood wastes, *Pulp wastes, *Water pollution, *Bottom sediments, *Degradation(Decomposition), Water pollution sources, Pulp and paper industry, Wastes, Industrial wastes, Pollutants, Fibers(Plant), Bark, Lignins, Sludge, Water pollution, Water quality, Organic matter, Clays, Sands, Inorganic compounds, Gases, Porosity, Structure, Hydrogen ion concentration, Temperature, Humus, Decomposing organic matter, Foreign countries, Europe.
Identifiers: Fillers, Mechanical pulp fibers, Chemical pulp fibers, *Kymi River(Finland).

In 1972 the Finnish forest industry discharged daily 5.6 million cu m of waste water containing 822 tons of solids. More efficient mechanical purification methods reduced this load to about 500 tons/day by the start of 1974. Fibers and bark fragments comprise the bulk of these solids. Fillers and sludge are minor components. These solids form rather thick sediments especially in discharge areas close to mills. A study of the disintegration of wood wastes in natural sediments was performed below the Kuusankoski mills on the Kymi River. Slow disintegration occurred in acidic (pH 4-5) and oxygen-poor or oxygen-free sediments. Deposits rich in organic matter (silt clay and fine sand gyttja) showed faster decay than those comprising mainly inorganic matter (coarse and fine sands), since the evolution of a gases from the former loosened their structure and increased their porosity. Water penetration and reduced gas formation caused a pH rise and promoted the disintegration of deeper layers. All processes were favored in the warmer seasons. A part of the fibers in top sediment layers disintegrated or were lifted by gas bubbles and floated with the stream. After 4 years, the decomposition of deeper layers appeared as erosion of the fiber surface and sometimes of the inner secondary wall layers, embrittlement and rupture of fibers, and formation of holes penetrating all fiber layers. Mechanical pulp (groundwood) fibers richer in lignin and containing shive-like bundles were more resistant to decomposition than lignin-poorer chemical pulp fibers. Bark decomposed into a finely dispersed humus-like material. (Brown-IPC)
W75-06882

DANGER, CARRYOVER FROM TALL OIL PERILS FISH, SHOULD BE CONTROLLED,
SCM Corp., Jacksonville, Fla. Glidden-Durkee Div.
Pulp and Paper, Vol 49, No 2, p 116-118, February, 1975. 2 tab, 22 ref.

Descriptors: *Chemicals, *Pulp wastes, Toxicity, *Fish, Sulfur compounds, Fish food organisms, Lethal limit, Toxins, Water pollution sources, Industrial wastes, Wastes, Pollutants, Inorganic compounds, Organic compounds, Effluents, Chemical wastes, Water pollution effects, Economics.
Identifiers: *Tall oil, Rosins, Fatty acids, Kraft mills.

Chemicals found in waste streams of kraft pulp mills and tall oil plants, notably sulfur compounds, as well as rosins and fatty acids, are known to be toxic to fish and fish food organisms. Control and improved recovery of tall oil is suggested as a financially attractive solution for the toxicity problem. Tables indicate minimum concentrations lethal to fish of several contaminants found in kraft pulp mill and tall oil plant effluents. (Sykes-IPC)
W75-06883

MERCURY IN THE WESTERN ENVIRONMENT.
For primary bibliographic entry see Field 5A.
W75-06897

MERCURY CONCENTRATIONS IN FISH,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 5A.
W75-06902

MERCURY IN AQUATIC SPECIES FROM THE PACIFIC NORTHWEST,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 5A.
W75-06903

MERCURY RESIDUES IN IDAHO FISHES - 1970,
Idaho Dept. of Fish and Game, Boise.
For primary bibliographic entry see Field 5A.
W75-06904

THE RATE OF LOSS OF MERCURY BY PACIFIC OYSTERS,
Washington Univ., Seattle. Coll. of Fisheries.
A. H. Seymour.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 85-90, 1973. 2 fig, 2 tab, 6 ref. FWQA (16040 EDG).

Descriptors: *Mercury, *Oysters, *Radioisotopes, Tracers, Biology, Aquatic waters, Sea water, Marine organisms, Discharge, Pollutant identification, Path of pollutants, Heavy metals.

A radioisotope of mercury (Hg203) with a 47-day half-life was used to estimate the rate of loss of mercury by individual oysters. After the oysters, Crassostrea gigaes had accumulated Hg203C12 directly from seawater in a laboratory aquarium, they were transferred to fresh seawater for nine days and then returned to their natural bed. Measurements of Hg203 in the oysters were made daily for the first nine days and at fortnightly intervals, thereafter, until the experiment was terminated in July, 1970 at 133 days. The rates of loss of Hg203 were approximately exponential for four periods (days 1-2, 2-9, 9-32 and 32-133). The average values for the total rate of loss by both radiological decay and biological turnover were estimated for the four periods, and from these estimates the biological half-life values were calculated. For the four periods, the biological half-life values for mercury, when added to water as mercuric chloride, were 4.9, 9.8, 21 and 44 days, respectively. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06906

MERCURY IN FUR SEALS,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Biological Lab.
R. E. Anas.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 91-96, 1973. 4 fig, 7 ref.

Descriptors: *Mercury, *Marine animals, *Alaska, *Distribution, Mammals, Animal physiology, Sampling, Analytical techniques, Spectroscopy, Data collections, Testing procedures, *Pollutant identification, Heavy metals.
Identifiers: *Pribilof Islands(Alas), *Fur seals.

Samples of liver and muscle tissue from pulp, young male, and adult female fur seals (Callorhinus ursinus) and brain tissue from adult female fur seals that were collected on the Pribilof Islands, Alaska and off the coast of Washington in 1970, were analyzed for mercury. All of the samples contained mercury with mercury levels higher in the liver than in muscle and brain. The mean values for liver tissues analyzed by flameless atomic absorption were 0.20 ppm for 10 pups, 10.8 ppm for 29 males, two and three years old, and 67.2 ppm for 29 females ages 5-19. The highest value obtained was 172 ppm in the liver of a 19-year-old female. The mean values for muscle tissues, also analyzed for flameless atomic absorption, were 0.06 ppm for five pups, 0.25 ppm for 29 young males and 0.26 ppm for 10 adult females. Increased levels of mercury in liver were significantly correlated with age, but levels in muscle could not be similarly correlated. The mean value for brain tissue analyzed by neutron activation analysis (NAA) was 0.22 ppm for seven adult females. Values from NAA were 52, 20, and 97% higher than those from atomic absorption for samples of liver from three adult females. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06907

MERCURY LEVELS IN CALIFORNIA SEA LIONS,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
D. R. Buhler, and B. R. Mate.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 97-102, 1973. 3 tab, 4 ref.

Descriptors: *Mercury, *Toxicity, Mammals, *Marine animals, *Food chains, Carnivores, Animal pathology, Animal physiology, Analytical techniques, Chromatography, Correlation studies, Organic compounds, Inorganic compounds, *Pollutant identification, Heavy metals.
Identifiers: *California sea lions.

An attempt was made to correlate the levels of mercury with the occurrence of a disease outbreak among California sea lions (Zalophus californianus). Analyses of mercury levels in ten sick or recently dead animals showed that these animals (which are the top carnivores of their marine food chain) accumulated very high levels in their tissues. There was, however, no correlation between the severity of the disease symptoms and mercury residues in the animals. The liver contained the highest concentrations of mercury, averaging 137 ppm. Only a small portion of the mercury present in the liver of these animals was in the form of methylmercury. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06908

THE GENERAL AND COMPARATIVE BIOLOGY OF TOXIC METALS AND THEIR DERIVATIVES: MERCURY AND LEAD,
Hawaii Univ., Honolulu. Environmental Center.
S. M. Siegel, A. Eshleman, I. Umeno, N. Puerner, and C. W. Smith.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 119-134, 1973. 8 fig, 7 tab, 31 ref. NASA (NGR-012-001-042).

Descriptors: *Mercury, *Lead, *Toxicity, *Growth rates, Correlation studies, *Heavy metals, Ions, Laboratory tests, Testing procedures, Analytical techniques, Spectroscopy, *Pollutant identification.

A program of comparative studies with heavy metals was carried out as part of a general survey of the ecological significance of environmental contaminants. More than 20 species of plants, invertebrates and unicellular forms were examined for their responses to mercury and its derivatives. Comparative studies were also conducted with lead compounds because of many similarities in the behavior of this metal and that of mercury in the environment. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06909

MERCURY CONTAMINATION IN CALIFORNIA'S FISH AND WILDLIFE,
California State Dept. of Fish and Game, Sacramento.
W. H. Griffith.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 135-139, 1973. 1 tab.

Descriptors: *Mercury, *Toxicity, *Game birds, *Fish, Public health, Foods, Seeds, Research and evaluation, Laboratory tests, Analytical techniques, Organic compounds, Inorganic compounds, Mining wastes, Industrial wastes, Effluents, *California, *Pollutant identification, Heavy metals.

Mercury contamination in pheasants originated from their ingestion of mercury-treated seed grain. Laboratory findings revealed that virtually all of the mercury in pheasants is methylmercury. The mercury contamination of the aquatic environment in California appeared to originate from urban and industrial effluents, mercury mines, and mercury lost during California's mining era. As a result of evaluations made in 1970, these three notices were issued to the public: (1) California pheasants were safe to eat throughout the state during the 1970 season as a result of prompt action taken by the California Department of Agriculture that restricted the use of mercurial fungicides and the treated seeds to application by permit only; (2) large striped bass and catfish from the Sacramento-San Joaquin Delta and San Francisco Bay areas should not be eaten more than once a week and pregnant women should not eat them at all; (3) mercury-treated seed should not be used as human or animal feed. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06910

PRELIMINARY STUDIES OF MERCURY TISSUE LEVELS FROM GAME BIRDS AND FISH IN UTAH,
Utah State Univ., Logan. Dept. of Toxicology.
F. A. Smith.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 140-165, 1973. 5 tab, 1 ref.

Descriptors: *Mercury, *Game birds, *Fish, *Utah, Toxicity, Laboratory tests, Analytical techniques, Spectroscopy, Testing procedures, *Pollutant identification, Heavy metals.

Mercury analyses were performed on 25 pheasants, 20 chukars and 18 fish collected in Utah. Results showed 9% of the pheasants to contain 0.5 ppm or more of mercury while 89% of the fish exceeded 0.5 ppm mercury. Walleye pike contained the highest concentrations of mercury, with levels up to 3.89 ppm. All chukar partridge examined had mercury levels well below 0.5 ppm. Analyses for DDT, DDE and dieldrin are also reported on 18 of the 25 pheasants and 13 of the 20 chukars that were analyzed for mercury. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06911

MERCURY-WILDLIFE STUDIES BY THE DENVER WILDLIFE RESEARCH CENTER,
Bureau of Sport Fisheries and Wildlife, Denver, Colo. Denver Wildlife Research Center.
L. C. McEwen, R. K. Tucker, J. O. Ells, and M. A. Haegele.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 146-156, 1973. 3 fig, 6 tab, 7 ref.

Descriptors: *Mercury, *Wildlife, *Game birds, *Toxicity, Colorado, Laboratory tests, Laboratory animals, Analytical techniques, Spectroscopy, Testing procedures, *Pollutant identification, Heavy metals.

Several studies have been undertaken to determine mercury-wildlife effects and relationships. These studies have included investigations of: (1) the acute oral toxicity of some common mercury-containing fungicides to mallard ducks and other captive birds; (2) mercury residues in tissues of gray partridges fed wheat treated with Ceresan L(trademark), (3) effects of daily Ceresan M(trademark) doses on pheasant reproduction and of single doses of Ceresan M(trademark) to mallard and coturnix quail on eggshell thickness; and (4) acute oral toxicity of Ceresan M(trademark) to wild pheasants in a natural habitat. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06912

MERCURY IN PHEASANTS AND OTHER BIRDS FROM EASTERN WASHINGTON,
Washington State Dept. of Game, Olympia.
J. B. King, and J. B. Lauckhardt.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 157-166, 1973. 5 tab, 3 ref.

Descriptors: *Mercury, *Game birds, *Washington, *Distribution, Birds, Analytical techniques, Animal physiology, Toxicity, Data collections, *Pollutant identification.
Identifiers: Pheasants.

A total of 81 game birds were analyzed for mercury by the Washington State Game Department. Analysis was done by neutron activation at Washington State University Reactor Center. Of 27 winter road-killed and spring-collected pheasants, three birds were found with an excess of 0.5 ppm mercury in liver tissue. Liver samples from two birds were below 1 ppm, but one exceeded 4 ppm. Breast tissue from only one bird contained more than 0.5 ppm mercury. Experimental birds provided with seeds that had been treated with an ethylmercury-type fungicide refused to consume any appropriate quantities of the seed. The maximum concentration of mercury achieved in the birds was 2.6 ppm in liver tissue. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06913

MERCURY LEVEL STUDIES IN MIGRATORY WATERFOWL,
Reed Coll., Portland, Oreg. Dept. of Chemistry.
L. S. Arighi.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 167-171, 1973. 3 fig, 2 tab.

Descriptors: *Mercury, *Waterfowl, *Oregon, Game birds, Ducks, Sampling, Analytical techniques, Radioisotopes, *Distribution, *Pollutant identification, Heavy metals.

Neutron activation analysis was used to determine the concentration of mercury in migratory waterfowl, primarily ducks, taken at the Sauvies Island Game Management area in Oregon during the 1970-71 hunting season. The study was conducted on a small sample of four prominent species of the area: mallard, pintail, widgeon and greenwing teal. Gamma spectra from the initial samples showed the presence of Se75 as well as Hg203. This caused some difficulty in determining mercury levels and limited the mercury determinations. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06914

MERCURY IN HUNGARIAN PARTRIDGE AND IN THEIR NORTH CENTRAL MONTANA ENVIRONMENT,
Montana Fish and Game Dept., Choteau.
J. P. Weigand.

In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 172-185, 1973. 2 fig, 8 tab, 13 ref.

Descriptors: *Mercury, *Game birds, *Montana, Data collections, Animal physiology, *Food chains, On-site data collections, Analytical technique, Spectroscopy, Seeds, Grain, *Pollutant identification, Heavy metals.
Identifiers: *Hungarian partridge.

From October, 1969 through October, 1970, 69 Hungarian partridge collectively representing both sex and age classes were collected from north central Montana. Mercury was detected in breast muscle of each specimen. The mean mercury contents in muscle tissue from males and females were 0.17 ppm and 0.13 ppm, and for adults and juveniles, 0.16 ppm and 0.15 ppm. Maximum concentrations of mercury in breast muscle occurred in December, February and July, whereas the lowest level occurred in April and May. Mercury concentrations in two of three eggs extracted from oviducts exceeded the levels found in the breast muscle of the hens. Mercury levels in breast muscle of partridges five and seven weeks old were less than that found in eggs. Of 39 soil samples, 34 (87%) contained less than 0.10 ppm mercury. Breast muscle from 58% of the partridge tested exceeded the 0.10 ppm mercury soil background. Two of three harvested barley samples that were spilled contained less than 0.05 ppm mercury and the third had 0.10 ppm mercury. Two wheat samples each tested 0.09 ppm mercury. Limited sampling indicates mercury levels in partridge from north central Montana are not high enough to result in widespread mortality nor in interference with reproduction. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06915

AN ANALYSIS OF MERCURY RESIDUES IN IDAHO PHEASANTS,
Idaho State Dept. of Health, Boise.
D. W. Brock, F. Shields, III, E. R. Norberg, and J. E. Cline.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 186-198, 1973. 1 fig, 5 tab, 7 ref.

Descriptors: *Mercury, *Game birds, *Idaho, *Seasonal, Spring, Sampling, Animal populations, Analytical techniques, Spectroscopy, Chromatography, Seeds, Toxicity, Pollutant identification, Heavy metals.
Identifiers: Pheasants.

Mercury residues in Idaho pheasants were determined. The study was also designed to evaluate seasonal variations of mercury levels and to compare results obtained with various analytical methods. A total of 246 pheasants were tested over a period of approximately 1 1/2 years. Six sets of samples were collected from areas where high pheasant population and heavy hunting pressures occur. The samples were tested for mercury by neutron activation, dithizone, and gas liquid chromatography procedures. The results showed that the highest levels of mercury occurred in the spring, indicating that the chief source of pheasant contamination is mercury-treated seed grain planted during that time of the year. They also demonstrated that comparative results can be obtained using different analytical methods. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06916

SEASONAL VARIATIONS IN MERCURY CONTENT OF OREGON PHEASANTS,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
D. R. Buhler, R. R. Claeys, and H. J. Rayner.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 199-211, 1973. 6 fig, 4 tab, 13 ref.

Descriptors: *Mercury, *Game birds, *Oregon, *Seasonal, Data collections, Regions, Seeds, Sampling, Animal physiology, Organic compounds, Inorganic compounds, Toxicity, Regulations, Pollutant identification, Heavy metals.
Identifiers: Pheasants.

One hundred and eighty-seven ring-necked pheasants were collected for mercury analysis in April, August, October and December, 1970 from three agricultural areas of Oregon, including Malheur County, Umatilla County and the Willamette Valley (Benton, Lane, Linn, Marion, Polk and Yamhill counties). The major source of mercury contamination in Oregon pheasants appeared to be from mercury fungicides used in the treatment of seeds for agriculture. The mercury content of the birds, therefore, varied appreciably according to season and location, reflecting the crops grown in the area and the dates of sampling and planting. Pheasants from Malheur County, Umatilla County and the Willamette Valley contain mean mercury concentrations in breast muscle of 0.189, 0.007 and 0.246 ppm, respectively. The mercury content of muscle tissue ranged between 0.001 and 6.33 ppm mercury with 14 of the 187 birds examined exceeding the 0.5 ppm U.S. Food and Drug Administration guideline value. Most of the mercury present in the tissues of the pheasants was in the methylmercury form. A high ratio of mercury concentration in the liver to that in muscle was found in many birds and was apparently associated with recent consumption of the mercury-treated seeds. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06917

PHEASANT FEEDING STUDY USING SEEDS TREATED WITH METHYL AND PHENYLMERCURY,
Bureau of Sport Fisheries and Wildlife, Boise, Idaho. Div. of River Basin Studies.
E. R. Norberg, D. W. Brock, F. Shields, III, and J. E. Cline.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 212-218, 1973. 1 fig, 3 tab, 5 ref.

Descriptors: *Mercury, *Organic compounds, *Seeds, *Game birds, On-site tests, Analytical techniques, Chromatography, Toxicity, *Absorption, Pollutant identification, Heavy metals.

Groups of ring-necked pheasants (Phasianus colchicus torguatus) were fed wheat treated with phenylmercuric acetate or methylmercury dicyandiamide fungicides. The birds failed to accumulate appreciable amounts of the phenylmercury compound but significant retention occurred when pheasants were fed the wheat treated with the methylmercury derivative. A differential rate of buildup and decline (after removal of the treated feed) was noted between male and female birds. Male birds tended to accumulate mercury more rapidly than females and mercury levels in the males remained at a high level throughout the entire exposure and recovery period. The buildup of mercury in hens, however, tended to occur more slowly but reached a higher peak and started to decrease more rapidly than with the male birds. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06918

SEMI-AUTOMATED DETERMINATION OF MERCURY IN FISH TISSUE,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W75-06921

THE HUMAN HEALTH HAZARDS OF METHYLMERCURY,
Mayo Clinic, Rochester, Minn. Dept. of Medical Statistics, Epidemiology and Population Genetics.
L. T. Kurland.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 283-297, 1973. 1 fig, 35 ref.

Descriptors: *Mercury, *Organic compounds, *Public health, *Human pathology, Toxicity, Animal pathology, Fish, Animal physiology, Human physiology, Analytical techniques, Pollutant identification, Heavy metals.
Identifiers: *Methylmercury.

The findings of a special committee of the U.S. Public Health Service were discussed. The purpose of the Committee was: (1) to review events of mercury poisoning in human and animal populations; (2) to clarify the sources and risks of mercury and especially the reported high levels of mercury in fish; and (3) to make recommendations for the further studies of the effects of mercury and its compounds aimed at providing better methods of control. The report includes sections on the medical implications of mercury ingestion, microbial transformation of mercury in the environment, ecological effects of methylmercury contamination including the effects on fish and wildlife, and analytical methods for mercury compounds. The recommended allowable daily intake (ADI) was 0.03 mg methylmercury for a 70 kg mass. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06925

EXPERIMENTAL PORCINE METHYLMERCURIALISM,
Washington State Univ., Pullman. Dept. of Veterinary Pathology.
R. C. Piper, V. L. Miller, and E. O. Dickinson.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 298-310, 1973. 3 tab, 17 ref.

Descriptors: *Mercury, *Organic compounds, *Toxicity, *Hogs, Testing procedures, Laboratory tests, Laboratory animals, Animal physiology, Animal pathology, Analytical techniques, *Pollutant identification, Heavy metals.
Identifiers: *Methylmercury.

Toxicity, symptomatology, clinical course, and distribution of mercury in tissues were determined and correlated in pigs given single and daily oral doses of methylmercury dicyandiamide (MMD) for 30 consecutive days or until death or euthanasia in extremis. The minimal fatal oral dose of MMD to pigs was 20 mg MMD/kg body weight. Signs of toxicosis were observed in pigs given single doses as low as 5 mg MMD/kg but not in pigs given 2.5 mg MMD/kg. The minimal fatal repetitive oral dose of MMD was 0.65 mg MMD/kg after 26 or 30 daily doses. Single large doses of MMD caused a severe gastroenteritis that progressed rapidly to shock, coma and death 12-28 hours after dosage. Signs of toxicity, tissue concentrations and distribution of mercury differed among pigs that survived the initial oral dose for at least five days. Neurological disturbances were the most characteristic clinical signs. Mercury was widely distributed throughout the body. Concentrations of mercury were highest in the renal cortex with the second highest levels in the liver. Moderately large concentrations were also present in the renal medulla and skeletal muscles. Concentrations of mercury in the skeletal muscles and brain were much higher than those reported in experimental porcine inorganic and arylmercurialism. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06926

THE HUMAN MORPHOLOGICAL LESIONS OF METHYLMERCURY INJURY,
Washington Univ., Seattle. Dept. of Pathology.
N. K. Mottet.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 311-319, 1973. 5 fig, 14 ref.

Descriptors: *Mercury, *Organic compounds, *Human pathology, *Cytology, Toxicity, Human physiology, Public health, Inorganic compounds, *Pollutant identification, Heavy metals.
Identifiers: *Methylmercury.

A review of the relatively few well-documented human autopsy case reports dealing with the effects of methylmercury compounds in chronic mercury intoxication was presented. The lesions of adults who died within two months of intoxication differed in several important respects from those who died several months or years after the injury. Deaths that occurred within two months of exposure revealed the accumulation of edema fluid in the brain and turbid, edematous meninges. Those cases that survived longer had fibrous thickening of the meninges and decrease in brain size (atrophy) with a compensatory increase in fluid. Acute lesions were also found in the skin, liver, kidneys and cardiovascular system. The blood vessels of the control nervous system and elsewhere in the body had perivascular dilatation and edema and in long-standing cases there were capillary proliferation and thickening of the vessel wall. Slight intimal thickening was seen in the small arteries. A catarrhal type of acute inflammatory change occurred in the mucous membrane of the digestive tract, especially in the duodenum. Fatty change, degeneration and necrosis were frequently observed in the liver and kidneys. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06927

METHYLMERCURY TOXICITY: A PROBABILISTIC ASSESEMENT,
California Univ., Berkeley. School of Public Health.
R. C. Spear, and E. Wei.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 320-327, 1973. 4 fig, 2 tab, 7 ref.

Descriptors: *Mercury, *Toxicity, *Statistics, *Mathematical models, Organic compounds, Mathematical studies, Probability, Fish, Public health, Foods, *Food chains, Pollutant identification, Heavy metals.
Identifiers: *Methylmercury.

Methylmercury intake via contaminated foodstuffs was assessed in a probabilistic context. The statistical variables considered included the degree of contamination, the quality of food consumed and the consumption frequency. The results indicated that computer simulation techniques can relate consumption patterns to the proportion of an exposed population at risk. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06928

MERCURY CONTAMINATION-PRIBILOF ISLANDS,
Center for Disease Control, Atlanta, Ga.
F. Hochberg, and S. Sherman.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 328-331, 1973. 1 fig, 1 tab, 4 ref.

Descriptors: *Mercury, *Toxicity, *Human pathology, *Alaska, Contaminants, Public health, Organic compounds, Human physiology, Correlation studies, On-site data collections, Laboratory tests, Analytical techniques, Sampling, Pollutant identification, Heavy metals.
Identifiers: *Pribilof Islands(Alas).

An effort was made to determine the potential for neurologic dysfunction in individuals with chronic low-level mercury exposure. The residents of St. Paul Island, the largest of the Pribilof Islands, were studied because of their consumption of seal meat and liver, which is high in mercury content. 30% of the households surveyed contained at least one individual with neurologic symptoms. However, clinical evaluation of all those diagnosed or symptomatic cases failed to reveal evidence suggesting that neurologic disease was related to mercury exposure. Neutron activation analysis of hair samples obtained from the residents of St. Paul revealed mean mercury levels of 4.45 ppm. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06929

THE PHARMACODYNAMICS OF MERCURY AND ITS COMPOUNDS WITH EMPHASIS ON THE SHORT-CHAIN ALKYLMERCURIALS,
Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.
T. W. Clarkson.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 332-354, 1973. 11 fig, 9 tab, 41 ref. AEC(W 7401-Eng-49)/NIH (GM105190-04).

Descriptors: *Mercury, *Absorption, *Mammals, *Distribution, *Metabolism, Organic compounds, Inorganic compounds, Foods, Animal physiology, Resins, *Pollutant identification, Heavy metals.

Short-chain alkylmercurials were compared with other classes of mercury compounds in respect to rates of absorption from food, patterns of distribution and deposition in the mammalian body, rates of biotransformation to inorganic mercury and pathways of excretion. Recent findings on the mechanisms of fecal excretion of methylmercury were discussed. Preliminary findings were presented on the use of new mercury binding resins to facilitate excretion. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06930

EFFECTS OF CERTAIN CHEMICAL POLLUTANTS ON SMALL AQUATIC ANIMALS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5A.
W75-06981

BIOLOGICAL EFFECTS OF METHYL MERCURY IN AQUATIC SYSTEMS ON MALLARDS AND SCAUP,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
J. R. Ford, and H. H. Prince.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 383, $4.75 in paper copy, $2.25 in microfiche. Completion Report, Michigan Institute of Water Research, East Lansing, March 1975. 73 p, 9 fig, 16 tab, 63 ref. OWRT A-052-MICH(1). 14-31-0001-3522.

Descriptors: *Mercury, *Reproduction, *Ducks(Domestic), Water pollution effects, Waterfowl, *Mallard ducks, Lethal limit, Toxicity, Food and cover crops.
Identifiers: *Methyl mercury, Survival, *Scaup, Hatchability, Ducklings, Food consumption.

The effect of mercury contamination in an aquatic system on the survival and reproduction of two waterfowl species was evaluated. Mallards (Anas platyrhyncos) and scaup (Aythya spp.), during October and November, were estimated to have daily total mercury consumption rates of 0.008 and 0.681 mg, respectively. Scaup, during March, were estimated to consume 0.175 mg total mercury daily. Feeding experiments with mallards indicate that consumption of methyl mercury can lower both survival and reproduction. Lethal effects were observed after both male and female mallards consumed 60.3 plus or minus 13.4 mg of methyl mercuric chloride at varied doses above 0.5 mg per day over a 120 day period. Reductions in hatchability of eggs and survival of ducklings were observed at doses less than 0.5 mg per day. Time, sex and reproductive status affected the decline of total mercury levels in breast, brain, liver and kidney tissues of mallards after a single 8 mg dose. It took from 30 to more than 90 days for mercury levels in tissues to decline below 1 ppm after a 8 mg dose.
W75-06985

BACTERIAL METHANE OXIDATION AND ITS INFLUENCE IN THE AQUATIC ENVIRONMENT,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W75-06987

LETHAL AND SUBLETHAL EFFECTS OF HERBICIDES ON ZOOPLANKTON SPECIES,
Tennessee Univ., Knoxville. Dept. of Zoology.
D. L. Bunting, and E. B. Robertson, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 337, $3.75 in paper copy, $2.25 in microfiche. Tennessee Water Resources Research Center, Knoxville, Report No. 43, April 1975. 35 p, 14 tab, 29 ref, $3.00. OWRT A-028-TENN(1).

Descriptors: *Zooplankton, *Herbicides, Aquatic life, Daphnia, Water pollution effects, *Lethal limit, Diptera, Copepods, 2-4-D, Rotifers, *Toxicity, 2-4-5-T.
Identifiers: *Sublethal effects, Amitroles.

Nauplii, 0-4 hours old, of the copepod Cyclops vernalis were exposed to concentration ranges of amitrole, amitrole-T, and the free acid and alkanolamine salt of 2,4-D. LD50, LT50, and incipient lethal levels were calculated and discussed. Adult Cyclops vernalis, Mesocyclops edax, and Macrocyclops albidus were exposed to amitrole and the 2,4-D salt to provide comparative data. Third and fourth instar larvae of Chaoborus punctipennis, a planktonic dipteran, were subjected to static tests of the commercial herbicides containing 2,4-D, ammonium sulfamate, and amitrole. Fifty percent responses were calculated for each herbicide, and an emergence-suppression threshold was noted for amitrole. Data were obtained for three rotifers, Keratella cochlearis, K. americana, and Brachionus angularis, relative to the acute toxicity of six water soluble or water emulsifiable forms of 2,4,5-T. Technical 2,4,5-T was also assayed against K. cochlearis. Data on the effects of food level on LT50, and food level, dose, and exposure time on LC50 were given. The effects of temperature, exposure time, and concentration of aminotriazole on Daphnia pulex females and males were measured. LT50 data were presented along with a discussion of sublethal effects and information from preliminary tests using forms of 2,4-D and 2,4,5-T.
W75-06989

MUSSELS AND POLLUTION IN THE RED RIVER DRAINAGE, NORTH DAKOTA AND MINNESOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
A. M. Cvancara.
Research Report No. WI-221-019-74, November, 1974, 3 p, 4 ref.

Descriptors: *North Dakota, *Minnesota, *Mussels, Ecology, Distribution, River flow, Water pollution, Turbidity, Drainage.
Identifiers: *Red River Valley(NDak).

Thirteen species of mussels inhabit the Red River of the North and 18 of its tributaries in eastern North Dakota and western Minnesota. Eight mussel species have been collected from the Red River, and 1-13 species from each of its tributaries. The four most common species are Lasmigona complanata, Anodonta grandis, Anodontoides ferussacianus and Lampsilis siliquoidea. Five species, Amblema costata, Quadrula quadrula, Proptera alata, Ligumia recta latissima and Lampsilis ventricosa, are generally characteristic of the larger rivers in the Red River Valley. Lasmigonia

compressa and Anodontoides ferussacianus are generally indicative of smaller rivers in the Valley. The mussel fauna of the Red River Valley, which is part of the Hudson Bay drainage, originated from that of the Mississippi River system. The Valley fauna, however, constitutes only 26 percent of that of the Mississippi. Four ecological factors are presumably of primary importance in restricting the distribution of mussels in the Red River Valley. These are: prolonged lack of river flow, high chloride content, water pollution and possibly high turbidity.
W75-06992

DISTRIBUTION AND ECOLOGY OF RIVER MOLLUSKS IN CENTRAL AND WESTERN NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W75-07105

THE WATER POLLUTION POTENTIAL OF REPRESENTATIVE PESTICIDES IN SELECTED ENVIRONMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
P. H. King, H. H. Yeh, and C. W. Randall.
Paper presented at the Second Annual Environmental Engineering and Science Conference, University of Lousiville, Lousiville, Kentucky, April 1, 1972. 18 p, 11 fig, 7 ref.

Descriptors: *Water pollution effects, *Environmental effects, *Pesticides toxicity, *Pollutant identification, *Persistence, *Organic compounds, Algae, Algal toxins, Pesticide kinetics, Carbamate pesticides, Organic pesticides, Food chains, Euglena, Chlorella, Pesticides, Pesticide residues.
Identifiers: Lindane, Parathion, Chloroisopropyl carbonate.

An understanding of the distribution and persistence of pesticides in selected aquatic environments is a key to evaluation of their pollution potential as well as determining the ultimate fate of these materials. An experimental basis for predicting the impact of selected pesticides on the general environment by means of studies of their distribution and persistence in selected specific environments is described. Laboratory investigations were carried out to study the fate of three representative pesticides, lindane, parathion and chloroisopropyl carbamate (CIPC), in aquatic systems containing large concentrations of algal cells. The results are compared with data previously reported for uptake on inorganic sorbents. Persistence studies showing pesticide degradation in similar algae laden systems are also described. The algae used in the experimental work were of the genera Euglena and Chlorella. The uptake of pesticides from water solution by algae illustrates one possible means by which pesticides may be introduced into the food chain and thus eventually be concentrated in higher animals such as fish. (Poertner)
W75-07114

THE EFFECT OF SEDIMENT ON RESERVOIR WATER QUALITY,
Virginia State Water Control Board, Richmond.
Y. Samuel, and C. W. Randall.
A paper presented at the AICHE/EPA Second National Conference on Complete Water Reuse: Water's Interface with Energy, Air, and Solids, Chicago, Illinois, May 4-8, 1975. 36 p, 6 tab, 5 fig, 10 ref.

Descriptors: *Sediments, *Phosphates, *Water quality, *Reservoirs, *Sewage treatment, *Eutrophication, Sediment-water interfaces, Sedimentation, Silting, Interfaces, Deposition(Sediments), Phosphorus.
Identifiers: Reservoir water quality.

The quality of water in the Occoquan Reservoir has deteriorated considerably during recent years. This was largely the result of sewage treatment discharges to Bull Run and its tributaries. The treated effluents contain large quantities of nitrogen and phosphorus which add to the Reservoir nutrient load and accelerate eutrophication. The relationship among silt, sediment, and water quality in the Reservoir as measured by phosphorus concentration was defined. A primary concern was how phosphates are released from sediment to the overlying water under different conditions, and whether sediment acts principally as a source or sink for phosphates. The assay procedure was evaluated and once the accuracy was established it was possible to study the effect of selected parameters on phosphate release. The rate of release of phosphates was found to be unaffected by pH changes, depth of sediment, and the depth of overlying water. The rate of release of phosphates was enhanced by anaerobic conditions, concentration of phosphates in the sediment, and a rise in temperature. Other nutrients such as carbon and nitrogen are also released with phosphates. The sediment may act as a sink or source for phosphates, depending on the phosphate concentration in the overlying water. (Poertner)
W75-07116

SOCIAL AND ECONOMIC IMPACTS OF WASTE WATER MANAGEMENT IN THE MERRIMACK BASIN,
Abt Associates, Inc., Cambridge, Mass.
M. Eigerman.
In: The Merrimack: Design for a Clean River, American Society of Civil Engineers, National Meeting, Session No. 17, Washington, D.C., January 30, 1973. 6 p.

Descriptors: *Administration, *Alternate planning, *Water pollution control, *Planning, *Regional analysis, Social impact, *Waste water treatment, Tertiary treatment, Management, Effects, Forecasting, Economic impact, Environmental effects, Water quality control, New Hampshire, Massachusetts.
Identifiers: *Merrimack River Basin, Matrix analysis.

In the study of the Merrimack River Basin, the task was to identify and, wherever possible, quantify significant social and economic changes resulting from alternative advance wastewater treatment processes marshalled into alternative management schemes. The single objective was maximum feasible purity of major point-source waste discharges. Social impacts were addressed by using a two-dimensional matrix handling fifteen impact categories and six sub-areas of the Merrimack Basin. By applying the matrix to each of seven Corps alternative plans and to a 'baseline scenario' represented by the States' implementation plans, three determinations for each cell were made; whether there were significant impact, whether the direction of change was upward, downward, or stable and finally, whether the change so characterized would have generally positive or negative effects. The economic side of the analysis concerned itself chiefly with quantifying the agricultural, industrial and manpower implications of water-disposal versus land-disposal alternatives. The Merrimack exercise demonstrated that social and economic impact assessment can be enormously useful planning input even at the feasibility level. Not only did it stretch the engineering mind into new and exciting territory, but it also will make some response to the planning jurisdiction's own aspirations practically inevitable. (Poertner)
W75-07121

WASTE WATER MANAGEMENT - A REGIONAL PROBLEM,
Corps of Engineers, New York. North Atlantic Div.
H. E. Schwarz.
In: The Merrimack: Design for a Clean River, American Society of Civil Engineers, National Meeting, Session No. 17, Washington, D.C., January 30, 1973. 5 p.

Descriptors: *Regional analysis, *Administration, *Water pollution control, *River basins, *Planning, Water quality control, Waste water treatment, Alternate planning, Effects, Impaired water quality, Environmental control, Ecology, Social impact, Management, New Hampshire, Massachusetts.
Identifiers: *Merrimack River Basin, Waste water management.

The Northeastern United States Water Supply Study, or NEWS Study, was initiated by the North Atlantic Division of the Corps of Engineers in 1966. Waste management as a problem intimately linked to water supply came to the foreground. The Merrimack, already identified as a candidate for restoration as a water supply source, was selected as one of the test cases. The Merrimack River, now grossly polluted, previously had been thoroughly studied for conventional waste treatment. Maximum feasible purity of waste discharges and the reclamation of waste water and some of its pollutants for beneficial uses was the goal. A task force was assembled in the New England Division office of the Corps of Engineers at Waltham that integrated people from several Corps offices, from other Federal agencies, from Universities and from private consulting firms into a single study team. Their task was to prepare a feasibility report in six months that would: (1) determine the nature and extent of the Merrimack River's pollution problem; (2) develop and screen alternative technical solutions to that problem, and (3) analyze the changes that the most likely of these solutions might have on the ecologic, hygienic, aesthetic, social and economic character of the Merrimack Basin. (Poertner)
W75-07124

IMPACT ANALYSIS: HINDSIGHT AND FORESIGHT IN SASKATCHEWAN,
Saskatchewan Fisheries Lab., Saskatoon.
For primary bibliographic entry see Field 6G.
W75-07171

HYDROELECTRIC DEVELOPMENT OF THE NELSON RIVER SYSTEM IN NORTHERN MANITOBA,
Manitoba Hydro, Winnipeg.
For primary bibliographic entry see Field 6G.
W75-07172

ENVIRONMENTAL IMPACT OF THE CHURCHILL FALLS (LABRADOR) HYDROELECTRIC PROJECT: A PRELIMINARY ASSESSMENT,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 6G.
W75-07173

ECOLOGICAL CONSEQUENCES OF THE PROPOSED MORAN DAM ON THE FRASER RIVER,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 6G.
W75-07174

DEVELOPMENT OF JAMES BAY: THE ROLE OF ENVIRONMENTAL IMPACT ASSESSMENT IN DETERMINING THE LEGAL RIGHT TO AN INTERLOCUTORY INJUNCTION,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 6G.
W75-07175

ECOLOGICAL CHANGES DUE TO HYDROELECTRIC DEVELOPMENT ON THE SAINT JOHN RIVER,
Fisheries and Marine Service, Halifax (Nova Scotia). Resource Development Branch.
For primary bibliographic entry see Field 6G.
W75-07176

IMPACT OF THE BENNETT DAM ON THE PEACE-ATHABASCA DELTA,
Canadian Wildlife Service, Edmonton (Alberta).
For primary bibliographic entry see Field 6G.
W75-07177

SEASONAL NITRATE CYCLING AS EVIDENCE FOR COMPLETE VERTICAL MIXING IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Div. of Environmental Studies.
H. W. Paerl, R. C. Richards, R. L. Leonard, and C. R. Goldman.
Limnology and Oceanography, Vol 20, No 1, p 1-8, January 1975. 2 fig, 1 tab. NSF-RANN Grant GI-22.

Descriptors: *Limnology, *Nitrogen cycle, *Lake morphometry, Nitrates, Bacteria, Lakes, Mixing, Freshwater, Bodies of water, Turnover, Euphotic zone, Nitrification, Detritus, *California, Nevada.
Identifiers: *Nitrate cycling, *Lake Tahoe(Calif-Nev).

A study of annual nitrate cycling in Lake Tahoe provided evidence that the lake is both oligotrophic and holomictic. Beginning with the spring phytoplankton bloom, a sequence of biological nitrogen transformations is responsible for formation of a nitrate gradient, characterized by a distinct 'nitracline.' The main processes responsible are nitrate depletion by phytoplankton uptake and deep water nitrification by bacteria. Sinking detritus appeared to be the main source of reduced nitrogen available for nitrification. As cooling proceeded during fall and winter 1972, depression of the nitracline revealed the process of vertical mixing and eventual turnover of the water mass. (Jess-ISWS)
W75-07198

CHEMICAL AND BIOLOGICAL QUALITY OF LAKE DICIE AT AUSTIS, FLORIDA, WITH EMPHASIS ON THE EFFECTS OF STORM RUNOFF,
Geological Survey, Tallahassee, Fla.
A. G. Lamonds.
Available from NTIS, Springfield, Va 22161 as PB-239 014/As, $4.25 in paper copy, $2.25 in microfiche. Water-Resources Investigations 36-74, December 1974. 61 p, 7 fig, 9 tab, 12 ref, append.

Descriptors: *Eutrophication, *Algae, *Biological properties, *Lakes, *Florida, Chemical analysis, Data collections, Water analysis, Water quality, *Storm runoff, Water pollution sources, Storm drains, Limnology, Water pollution effects.
Identifiers: *Lake Dicie(Fla), *Lake County(Fla).

After a storm drain was constructed to carry runoff from part of the city of Eustis, Florida, into Lake Dicie, algal blooms occurred in the lake. Street runoff contains high concentrations of nitrogen, phosphorus, and lead, as well as other trace metals. The quantity of inorganic nitrogen and orthophosphate carried into the lake during the course of the investigation (March 1971 to June 1973) was equivalent to about 3,500 pounds of commercial 6-6-6 fertilizer and was more than sufficient to support large populations of phytoplankton. Algal blooms occurred in the winter when the lake slowly 'turned over,' mixing the nutrient-rich bottom water with water from the upper part of the lake. An experiment in which lake samples were fertilized with nitrogen and phosphorus indicated that the explosive growth of phytoplankton was related to the abundance of inorganic nitrogen which was available to the phytoplankton during the winter when the lake was not stratified. (Woodward-USGS)
W75-07213

EFFECTS OF RESERVOIR CLEARING ON WATER QUALITY IN THE ARCTIC AND SUBARCTIC,
Alaska Univ., College. Inst. of Water Resources.
D. W. Smith, and S. R. Justice.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-241 853, $3.25 in paper copy, $2.25 in microfiche. Report No. IWR-58, January 1975. 15 p, 1 fig, 4 ref. OWRT A-043-ALAS (1).

Descriptors: *Reservoirs, *Leaching, *Pre-impoundment, Surveys, Water quality, Soil classification, Economic justification, Water chemistry, Oxygen, Nutrients, Color, *Alaska, Hydrogen ion concentration, Alkalinity, Iron, Managanese, Temperature, Carbon, Conductivity, Soil moisture, Arctic, Subarctic.
Identifiers: Moose Creek(Alas), Kotzebue, Ship Creek, Monashka Creek, Barrow, Leaching columns, Leachate, Tannin/Lignin, Total organic carbon, Soil organic content, *Reservoir clearing.

A research project examining the advisability of clearing reservoirs in the Arctic and subarctic is described. Soil samples were collected from five Alaskan reservoir sites, classified as to particle size and organic content, leached in sealed six-inch diameter columns, and changes in electrical conductivity, alkalinity, tannin/lignin, dissolved oxygen, color, nitrate plus nitrite, ammonia, total orgaic carbon, iron, and manganese were determined on the leachate. Clearing was found to be advisable for reservoir sites at Mosse Creek, Ship Creek and Barrow, and was recommended, pending scour studies, for Monashka Creek. It was not found to be advisable for the Kotzebue reservoir site. An approach to the evaluation of the most economical depth of reservoir clearing, considering water treatment costs and clearing costs, is presented.
W75-07272

EXTREME FLUCTUATIONS IN WATER QUALITY OF EUTROPHIC FISH KILL LAKES: EFFECT OF SEDIMENT MIXING,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Water Research, Vol. 6, No. 11, p 881-888, 1974. 7 fig, 2 tab, 15 ref.

Descriptors: *Oxygen sag, *Lake sediments, *Sagponds, Fish farming, Cycling nutrients, Nitrogen compounds, Phosphorus compounds, Dissolved oxygen, Canada, Anaerobic conditions, Rainbow trout, Eutrophication, Fishkill, Upwelling, Cyanophyta.
Identifiers: Aphanizomenon flos-aquae, Erickson(Manitoba).

The pothole lakes, located in southwestern Manitoba, represent a great economic potential for summer fish farming. However, their periodic sedimentary nutrient releases and recurring anoxic conditions preclude successful aquacuiture. Ice and snow cover during 5-6 months reduces biological nutrient assimilation and is replaced by decomposition and anaerobic conditions. The lakes are re-aerated by a complete turnover after ice break up. Nearly pure cultures of Aphanizomenon flos-aquae blooms occur in mid-June; after their collapse in midsummer, bacterial decomposition of the dead algae cells is accompanied by a drop in dissolved oxygen, resulting in total fish kills. Decomposition releases substantial amounts of ammonia-N and orthophosphate-P, providing nutrients for another algal cycle. One of the possible triggering mechanisms for the collapse of algal blooms and fish kills is the upwelling of anoxic bottom water, apparently caused by heavy winds or stirred-up lake sediments. Test results demonstrated that even a short contact of lake water with upwelled sediments caused an immediate drop of DO and enrichment by ammonia to concentrations over 1 mg/l. Most of these lakes have already reached the eutrophic stage. The sediments are the major nutrient reservoir and are also the major source of BOD. Several restoration measures offer promise. (Auen-Wisconsin)
W75-07290

A COMPARATIVE STUDY OF PRIMARY PRODUCTION AND STANDING CROPS OF PHYTOPLANKTON IN A PORTION OF THE UPPER CHESAPEAKE BAY SUBSEQUENT TO TROPICAL STORM AGNES,
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.
M. E. Loftus, and H. H. Seliger.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-3278-23, $4.00 in paper copy, $2.25 in microfiche. Report COO-3278-2. (Undated). 32 p, 5 fig, 3 tab, 19 ref. AEC AT(11-1)3278, NSF FI 32110.

Descriptors: *Primary productivity, *Standing crops, *Phytoplankton, *Chesapeake Bay, Dinoflagellates, Salinity, Nutrients, Temperature, Light, Phosphates, Oxygen, Bacteria, Bottom sediments, Tropical cyclones.
Identifiers: *Upper Chesapeake Bay, *Hurricane Agnes.

Natural phytoplankton communities in Rhode River, West River and an adjacent section of Chesapeake Bay have been studied since June, 1969. There are statistically significant comparisons of baseline data from which both short-term and long-term effects of Hurricane Agnes (June 21, 1972) on phytoplankton populations can be evaluated. There was immediate dramatic change in relative species composition to favor large dinoflagellates and a 3-fold increase in man total phytoplankton standing crop during 1973. The rapidly increased phytoplankton crop was composed of an algal species endemic during the summer season. The bloom after the storm continued through the salinity recovery and nutrient depletion until the fall decline in temperature. The observations that standing crops of phytoplankton in 1973 equalled or surpassed the previous year's post-Agnes levels, that a 4-fold elevation of dissolved organic phosphate levels occurred in 1973 river samples above those observed in pre-Agnes samples and post-Agnes bay water, and that oxygen depletion in bottom waters in 1973 was associated with high bacterial levels are consistent with hypothesis that the amplification of normal species densities in 1973 resulted from utilization of organic material deposited in the bottom sediments by Agnes in the preceding year. (Jones-Wisconsin)
W75-07291

PERIPHYTON COLONIZATION AND PRODUCTIVITY IN THE REACTOR COOLING RESERVOIR--PAR POND,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
L. J. Tilly.
Available from the National Technical Information Service, Springfield, Va 22161 as DP-MS-7367, $4.00 in paper copy, $2.25 in microfiche. Report DP-MS-73-67 (Undated). 9 p, 2 fig, 1 tab, 2 ref. AEC AT(07-2)-1.

Descriptors: *Periphyton, *Productivity, *Cooling water, Nuclear power plants, Standing crops, Plant growth, Biological communities, Heated water, Regression analysis, Correlation analysis.
Identifiers: *Par Pond(SC), Artificial substrates.

The influence of thermal effluents upon periphyton are of interest because this component is often quantitatively important in aquatic food

chains and because its growth integratively reflects conditions in a fixed location. Glass microscope slides colonized by periphyton are being collected at six different locations at Par Pond, a reactor cooling reservoir on the Savannah River Plant in South Carolina, with varying thermal effluents for determinations of dry-weight standing crop, chlorophyll, species composition, and C14 productivity. Standing crops and productivity differ with proximity to the thermal discharge, and also by season, so that zones of maximum growth shift with time. Periphyton community characteristics are discussed in relation to limnological characteristics of the stations studied. In 19 of 25 experiments analyzed for 1973, a significant or highly significant relationship between periphyton production and mean growing temperature was found. When data from all experiments were composited for regression and correlation analysis, the evidence for temperature dependence vanished. If all such data are reduced to means for temperature and standing crop, and these are examined statistically, a highly significant relationship between average periphyton accumulation and growing temperature is found. (Jones-Wisconsin)
W75-07292

THE SEAWEEDS OF THE MURMANSK REGION IN THE VICINITY OF THE MALYY OLENIY (NEMETSKIY) ISLAND,
A. D. Zinova.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 715, $3.25 in paper copy, $2.25 in microfiche. NOO T-18, 1974. 14 p, 1 tab. Translated from Gosudarstvennyy Gidrologicheskiy Institut, Leningrad, No 21, p 88-97, 1935.

Descriptors: *Marine algae, *Distribution, Systematics, Biological communities, Iodine, Harvesting of algae.
Identifiers: *Sea weeds, Malyy Oleniy Island(USSR), Murmansk(USSR).

The growth, distribution, and abundance of sea weed in the region of Malyy Oleniy (Nemetskiy) Island in the Murmansk vicinity was investigated to determine the quantity of harvestable algae for the iodine industry. It was established that algae grow along the coasts of this island and continent and the width of the distribution belt reached 1-1.5 km along the island's northern coast, on its southern coast and on the continent, this width varied from 1 to 50 m. The seaweed concentrations on the Malyy Oleniy Island and those of the continental shore are listed according to their locations and species on the different types of shoreline. The total quantity of sea weeds torn loose during the 5-day observation period comprised 538.9 cubic meters, or 269.45 tons. Harvesting is hampered by lack of good roads and communications, as well as prevailing heavy surf and breakers and lack of moorings. (Jones-Wisconsin)
W75-07297

FISH AND WATER QUALITY CRITERIA.
Water Pollution Research Lab., Stevenage (England).
Notes on Water Pollution No 65, June 1974. 4 p, 3 fig, 1 tab, 11 ref.

Descriptors: *Toxins, *Water quality standards, *Fish, Hydrogen ion concentration, Ammonia, Heavy metals, Poisons, Copper, Nickel, Zinc, Cadmium, Calcium, Phenol, Toxicity, Bioindicators.
Identifiers: Hydrogen cyanide, Organic complexing substances.

Water quality, presence of multiple poisons and species differences of fish are important in the selection of water quality criteria. The toxicity of hydrogen cyanide and ammonia can be altered by the effects of pH, toxicity of heavy metals can be changed by water hardness, zinc by suspended solids, and copper by organic complexing substances. Physiological responses of fish to different calcium concentrations in water may affect the toxicity of heavy metals. Often mixtures of toxicants are present in polluted water. Also the effects of phenol, copper, and radioactive cadmium vary with fish species. The response rate of fish to a single poison normally differs from species to species and must be tested for a period long enough to permit determination of the concentration at which relative homeostasis occurs. To establish water quality standards for the protection of fisheries, the concentration of toxins in which fish can survive for a prolonged period of time, remain in good health, show good growth, and reproduce must be determined. Examples are given for survival of rainbow trout exposed to ammonia and zine; phenol; or cadmium, copper, or nickel in hard water; roach exposed to cadmium; and rudd to ammonia or zinc and hard water. (Buchanan-Davidson-Wisconsin)
W75-07298

STREAM POLLUTION BY FARM ANIMALS,
Louisiana Tech Univ., Ruston. Dept. of Agricultural Engineering.
J. W. D. Robbins.
In: 2nd Annual Environmental and Science Conference, April 20-21, 1972, University of Louisville, Kentucky, p 673-706. 5 tab, 4 ref.

Descriptors: *Streams, *Water pollution sources, *Domestic animals, Farm wastes, Agricultural runoff, North Carolina, Management, Soil disposal fields, Nitrates, Farm lagoons, Waste disposal, Groundwater pollution.
Identifiers: Land spreading.

The actual and potential importance of animal wastes in agricultural land runoff were investigated by quantifying factors governing timing, volume and concentration of waste discharges. The natural pollution load on streams draining agricultural basins free of farm animals and with appreciable rainfall and runoff, should be considered in water quality management. Pollution indices for streams receiving land drainage parallel stream hydrographs with extended drag-out on cessation of surface runoff. Soil provides natural treatment of animal wastes, thus land spreading is very effective in preventing water pollution. However, high applications of animal wastes per unit area may cause nitrate contamination of groundwater. Exclusive use of anaerobic lagoons for treating animal wastes is unsatisfactory in areas where rainfall exceeds evaporation. Dumping fresh animal wastes directly into streams should be prohibited. Although satisfactory estimating equations of general applicability for predicting waste contributions to surface waters based on animal number, temperature, and stream flow rate could not be developed from this short-term study, predictive relationships held quite well. Groundwater problems associated with properly located and managed animal production sites were minimal. Extent of water pollution caused by animal production units is almost entirely dependent upon production and waste management practices rather than on the volume of wastes involved. (Jones-Wisconsin)
W75-07299

ON THE THEORY OF NATURAL SELF-PURIFICATION OF RESERVOIRS,
G. B. Melnikov, F. P. Riabov, A. K. Stolbunov, and N. M. Karpushin.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 1320-1325, 1973. 5 ref.

Descriptors: *Self-purification, *Reservoirs, *Organic matter, *Oxidation, Bacteria, Denitrification, Rivers, Enzymes, Microorganisms, Turbulence.
Identifiers: Reservoirs(Dnieper River), USSR, Proteolytic bacteria.

Two ways of solving the pressing problem of clean water most practicable are regulating self-purification of natural bodies, and intensification of waste and sewage treatment. The combination of these measures is based on the fact that an exact estimation of natural self-purification rate and depth makes it possible to determine whether to let a basin destroy pollutants itself or to subject it to special treatment. The results obtained during 1960-1970 on two Dnieper River cascade reservoirs, Dneprodzerzhinsk and Lenin are reported. The aim was to disclose some peculiarities of natural self-purification of flat-country cascade reservoirs. The fact that a reservoir represented a complex system in which the opposite processes of natural pollution and natural self-purification occurred simultaneously was considered. When developing the general theory of cascade reservoir self-purification the following must be taken into account: the maximal rate of natural self-purification in downstream near-dam areas; the character of the biological agents of self-purification (denitrifying, phenol-destructive and proteolytic bacteria), facultative biochemical activities which facilitate mineralization of organic solutes in changeable environmental conditions; and estimation of pollution and self-purification rates using not only numbers but also the enzyme activities of microorganisms as agents of self-purification. (Jones-Wisconsin)
W75-07300

NUTRIENTS IN ICE. SOME DATA FROM A HIGH MOUNTAIN LAKE,
O. Groterud.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 327-333, 1972. 2 fig, 7 tab, 2 ref.

Descriptors: *Nutrients, *Lake ice, *Lakes, *Altitude, Snow, Phosphates, Nitrates, Nitrites, Ammonia, Height.
Identifiers: *Mountain lakes, Lake Ovre Heimdalsvatn(Norway).

The relationship between the nutrients in ice and in lake water was studied in a Norwegian lake, 1090 m above sea level. Snow and ice samples were collected from Lake Ovre Heimdalsvatn in polyethylene vessels, melted and tapped into polyethylene bottles. In order to avoid pollution, both the samples of ice and snow were taken with a plastic spoon. Analyses indicated a relatively high content of nutrients (phosphates, nitrates + nitrites, and ammonia) in the ice, and the most surprizing feature was the content of phosphates and its irregular, vertical as well as horizontal, distribution. Freezing experiments in the laboratory showed that lake waters increased in phosphate content after completely freezing in a sample bottle. The experiments indicated that phosphate can be released from some organic substances during the freezing process, and that this phenomenon also applies to the ice frozen on the lake. On the basis of hydrographical research just after the spring thaw, the relatively great amount of phosphate in the lake ice (and probably also in the ice of the drainage area) seems to have a great influence on the phosphate content of the water masses. (Jones-Wisconsin)
W75-07301

DIEL PERIODICITY IN THE PHYTOPLANKTON COMMUNITY OF THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND. I. PHYTOPLANKTONIC PRIMARY PRODUCTION AND RELATED FACTORS,
Helsinki Univ. (Finland). Dept. of Botany.
V. Ilmavirta.
Annales Botanici Fennici, Vol 11, No 2, p 136-177, 1974. 31 fig, 18 tab, 66 ref.

Descriptors: *Diurnal, *Phytoplankton, *Oligotrophy, *Primary productivity, Vertical migration, Biomass, Hydrology, Meteorology, Radiation, Thermal stratification, Algae, Light penetration, Light intensity, Environmental ef-

fects, On-site investigations, Respiration, Photosynthesis, Distribution, Suspended solids.
Identifiers: Lake Paajarvi(Finland).

Diurnal variations in productivity of phytoplankton in the oligotrophic Lake Paajarvi in Finland were strongly influenced by meteorological and hydrological conditions. Radiation was the most important environmental factor. Chemical factors varied with time, depth, and thermal stratification. Migration of algae from the surface occurred during periods of high light intensity. Distribution of non-motile specimens was determined by water movements. Surface inhibition of production and decrease of production with depth caused by light absorption were apparent in the production to biomass ratio. The difference between primary production in long exposures and the sum of short exposures varied; it was most pronounced in June and decreased in August. The effect of length of exposure decreased as the trophic status of the water rose. The composition and total volume of phytoplankton showed diurnal variations. Phytoplankton production was affected by dark fixation, respiration, and liberation of extracellular products. Primary production could be correlated to total radiation, but correlation to biomass and environmental factors was poor. The best parameter explaining plankton primary production and its diurnal variations was the production to biomass ratio, but production efficiency and the shape of the production depth curve showed no well defined relation to production. (Buchanan-Davidson-Wisconsin)
W75-07302

EFFICIENCY OF THE UTILIZATION OF NANNOPLANKTON PRIMARY PRODUCTION BY COMMUNITIES OF FILTER FEEDING ANIMALS MEASURED IN SITU,
Z. M. Gliwicz, and A. Hillbricht-Ilkowska.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 197-203, 1972. 1 tab, 14 ref.

Descriptors: *Secondary productivity, *Nannoplankton, *Primary productivity, *Zooplankton, *Grazing, Energy transfer, Bacteria, Tripton, Copepods, Oligotrophy, Dystrophy, Eutrophication.
Identifiers: *Filter feeding zooplankton, Calanoid copepods.

This discussion deals with the efficiency (ratio of food quantity ingested by consumer to the food quantity produced) as applied to the lake phytoplankton-zooplankton trophic system, or, more specifically, to the filter feeding zooplankton (filtrators and sedimentators) on the one hand, and to nannophytoplankton on the other. The method applied in this experiment of nannoplankton consumption involved comparison of the numbers of algae, bacteria cells and tripton particles in natural lake water in two containers with the same densities of zooplankters but the animals in one being inhibited and unable to graze. The anaesthetizing reagent (Physostigminum salicylicum) strongly affected the animal's neural system, but was totally neutral in relation to algae and bacteria. Gross primary production was measured as oxygen production (dark and light bottles) from which the net phytoplankton was removed by filtration through bolting cloth. Dominance of macrofiltrators, especially calanoid copepods, within the community of filter feeders results in very effective utilization of plankton net primary production by zooplankton. Nannoplankton growth and production are limited mainly by zooplankton grazing in oligotrophic and dystrophic lakes, while in more eutrophic lakes other factors seem to be more important in limiting these phenomena. (Jones-Wisconsin)
W75-07303

THE PRESENT CONDITION OF LAKE WASHINGTON,
W. T. Edmondson.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 284-291, 1972. 5 fig, 11 ref.

Descriptors: *Rehabilitation, *Lake Washington, *Pollution abatement, Washington, Water pollution control, Carbon dioxide, Oxygen, Nutrients, Plankton, Biological communities, Alkalinity, Phosphates, Nitrates, Chlorophyll, Light penetration.
Identifiers: *Sewage diversion.

During the period of 1941-1963 Lake Washington received increasing amounts of effluent from secondary sewage treatment plants. During 1963-1968 the sewage was diverted step-wise, and after February 1968 the effluents were halted. The lake's condition improved rapidly and sensitively with the changes in nutrient input. In the summer of 1971, the transparency has in fact exceeded that observed in 1950, and the hypolimnetic oxygen concentrations toward the end of summer 1969 were close to those of 1950. Thus lake has conformed to predictions. Nevertheless, the lake's condition is not yet identical to that of 1950; in particular plankton has not yet returned to its 1950 condition and appears to be still in transition. Since 1950 the watersheds have changed considerably--large areas have been deforested for urbanization with resultant environmental modifications. Nitrate and alkalinity are now higher than in 1950. However, the lake showed that it was able to accept a rather large increase in nutrients before it deteriorated, and that it could rapidly revert when relieved of that stress. (Jones-Wisconsin)
W75-07304

AN ECOLOGICAL STUDY OF THE KSC TURNING BASIN AND ADJACENT WATERS.
Florida Inst. of Tech., Melbourne.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-26905, $3.75 in paper copy, $2.25 in microfiche. Special Report No 6 to the John F. Kennedy Space Center, Florida, January 1974. 37 p, 23 fig, 2 tab. NASA NGR 10-015-008.

Descriptors: *Baseline studies, *Chemical properties, *Biological properties, *Physical properties, Florida, Hydrogen sulfide, Heavy metals, Benthic fauna, Benthic flora, Biological communities, Bacteria, Sulfates, Bottom sediments, Nutrients, Canals, Dredging, Basins, Borrow pits.
Identifiers: *Kennedy Space Center(Fla), *Turning Basin, Merritt Island(Fla), Banana River(Fla), Indian River(Fla).

This baseline investigation of the conditions existing in the waters and bottoms of the Kennedy Space Center Turning Basin near the Vertical Assembly Building, the borrow pit near Pad 39A and the Barge Canal connecting them, was to determine the various parameters of chemical, biological and microbiological significance as they existed prior to the proposed construction of new checkout facilities on the banks of the Turning Basin. The waters of the Turning Basin, barge canal, and borrow pit are quite similar to those of the Banana River and Indian River. They are, in general, well mixed and well oxygenated. A few deep pockets in the uneven bottom terrain approach anoxic conditions, and a mud sample from one of these areas had a strong hydrogen sulfide odor, indicating that it was anoxic. The absence of response in the tests for heavy metal ions is considered an indication that there was no industrial pollution present. The microbiological tests did not demonstrate E. coli, an indication that there is no waste pollution of these waters. The low diversity and low total populations of the benthic community are characteristic of the recent origin of these waters. (Jones-Wisconsin)
W75-07305

CHLOROPHYLL CONCENTRATIONS, WATER QUALITY, AND NUTRIENT CONCENTRATIONS IN CHEAT LAKE, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Biology.
J. W. Yahnke.
Proceedings West Virginia Academy of Science, Vol 45, No 2, p 155-163, 1973. 4 fig, 1 tab, 3 ref.

Descriptors: *Chlorophyll, *Lakes, *Nutrients, *West Virginia, Alkalinity, Chemical properties, Backwater, Phosphates, Seasonal, Sulfates, Hydrogen ion concentration.
Identifiers: *Cheat Lake(W Va).

Data on concentrations of primary nutrients and water quality variables in Cheat Lake, West Virginia are provided. Relationships between these variables are examined along with their effects on algal biomass, indicated by concentration of chlorophyll in the algal assemblage. Multivariate discriminant analysis was used to test whether there was a statistically significant difference between stations based upon chemical variables and chlorophyll concentrations. Based on the chemical environment, the lake and its two backwaters constitute three distinct systems, with Morgan Run intermediate between the lake and Ruble's Run. The chemical environment was found much more variable in the backwaters than in the lake due to incursions of lakewater into the backwaters, which were more frequent and more intense in Morgan Run than in Ruble's Run. Chlorophyll concentrations were much greater in the lake than in either of the backwaters; chlorophyll concentrations in both backwaters were similar. Chlorophyll concentrations were greater in the lake due to the greater stability of the chemical environment. Chlorophyll and dissolved phosphate showed marked seasonality falling to their lowest levels following onset of thermal stratification. (Jones-Wisconsin)
W75-07306

THE TROPHIC-DYNAMIC ASPECTS OF ECOSYSTEM MODELS,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
R. M. Sykes.
International Association Great Lakes Research, Proceedings 16th Conference Great Lakes Research, p 977-988, 1973. 3 fig, 3 tab, 11 ref.

Descriptors: *Trophic level, *Ecosystems, *Model studies, Biological communities, Nutrients, Food chains, Distribution, Dominant organisms, Equations, Succession.
Identifiers: Ecosystem trophic-dynamics.

A preliminary critique of the hypothesis that species in natural communities may be partitioned into trophic levels is discussed. The mathematical formulation employed in ecosystem models are statements of the trophic level concept and only indirectly, if at all, are they models of real ecosystems. The analysis of several common formulations of the supposition shows that the law of conservation of mass places certain restrictions upon the biomass in each trophic level and the mass fluxes between levels. These restrictions may be regarded as properties of the trophic level hypothesis. If the behavior of a particular community can be shown to conform to these restrictions, its species may be partitioned into trophic levels. Conversely, if the community's behavior does not conform to the derived restrictions, the trophic level assumption is not applicable. Interesting properties of the hypothesis concern the steady-state distribution of nutrients among the trophic levels. Changes in the nutrient input rate affect principally the top predator and alternate levels beneath it. Because of this, systems of trophic levels have parity. Removal or addition of a top predator level changes the system's parity and, therefore, the responses of all levels beneath. (Jones-Wisconsin)
W75-07307

PLANT NUTRIENTS IN SWEDISH LAKE AND RIVER WATERS,
T. Ahl.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 302-309, 1972. 5 fig, 1 tab, 5 ref.

Descriptors: *Nutrients, *Lakes, *Rivers, Nitrogen, Phosphorus, Municipal wastes, Industrial wastes, Land use, Urbanization, Watersheds(Basins), Agricultural runoff, Fertilizers, Annual.
Identifiers: *Sweden, Lake Vanern(Sweden), Lake Vattern(Sweden), Lake Malaren(Sweden), Lake Hjalmaren(Sweden), River Fyrisan(Sweden), River Skelleftealven(Sweden).

Variations of nitrogen and phosphorus in Swedish lakes and rivers and the nutrient loadings of Lake Vanern, Lake Vattern, Lake Malaren, and Lake Hjalmaren are presented. Many of the rivers flowing to the four large Swedish lakes had, in 1969, a mean concentration of total nitrogen between 1.5 and 4 mg/l, and contained from 0.08 to 0.24 mg/l of total P. There was an increasing N/P ratio in many rivers. The following N yield had been calculated for the catchment areas of Lake Malaren and Lake Hjalmaren, Lake Vanern, and Lake Vattern: 5.8, 3.5, and 2.9 kg/ha year, respectively. The yield of P is 0.50, 0.25, and 0.45 kg/ha year, respectively. These figures include N and P from nearshore municipal and industrial sources. To reach the admissible level, the nutrient load of Lake Malaren and Lake Hjalmaren should be reduced by 80-90% and 70-80%, respectively. With the present rate of urbanization and agricultural land use it is doubtful if this level can be reached. (Jones-Wisconsin)
W75-07308

GAMMARUS PREDATION AND THE POSSIBLE EFFECTS OF GAMMARUS AND CHAOBORUS FEEDING ON THE ZOOPLANKTON COMPOSITION IN SOME SMALL LAKES AND PONDS IN WESTERN CANADA,
Calgary Univ. (Alberta). Dept. of Biology.
R. S. Anderson, and L. G. Raasveldt.
Canadian Wildlife Service Occasional Paper No 18, 1974. 23 p, 4 fig, 7 tab, 51 ref.

Descriptors: *Amphipoda, *Diets, *Crustaceans, Diptera, Larvae, Fish food organisms, Competition, Midges, Canada, Copepods, Predation, Zooplankton.
Identifiers: Gammarus lacustris lacustris, Chaoborus americanus, Alberta, British Columbia.

The food and predatory feeding habits of Gammarus lacustris lacustris, Chaoborus americanus, and copepod species were studied in small lakes and ponds of the Alberta prairies and mountain lakes and ponds in western Alberta and eastern British Columbia to determine their importance in the food web of the aquatic community. Fish introduction may not immediately or permanently affect the population of the food organisms, such as Gammarus, but continuous stocking of large numbers of fish may. Gammarus adults capture and eat a variety of aquatic invertebrates of the same size or smaller with which they commonly co-occur. The intensity of predation probably affects the abundance of certain plankton species; low densities of certain species in oligotrophic lakes were probably due to Gammarus, Chaoborus, and Diaptomus. Experiments and data from 52 aquatic communities suggested that Gammarus predation may be an important reason why it rarely co-occurs with anostracans and why co-occurrence of Gammarus and Chaoborus was uncommon. The relative abundance of these two genera and their diurnal limnetic occurrence in fish-free lakes influenced the abundance of certain aquatic invertebrates and species composition of invertebrate communities. (Buchanan-Davidson-Wisconsin)
W75-07309

CRUSTACEAN PLANKTON COMMUNITIES OF 340 LAKES AND PONDS IN AND NEAR THE NATIONAL PARKS OF THE CANADIAN ROCKY MOUNTAINS,
Calgary Univ., Alberta. Dept. of Biology.
R. S. Anderson.
Journal Fisheries Research Board of Canada, Vol 31, No 5, p 855-869. 1 fig, 8 tab, 43 ref.

Descriptors: *Crustaceans, *Distribution, Zooplankton, Canada, Copepods, Cladocera, Predation, Competition, Salinity, Water temperature, Lakes, Ponds, Surveys, Varieties.
Identifiers: Prairie lakes, Alpine lakes, Alpine ponds, Anostracans, Alberta, British Columbia.

A total of 97 crustacean plankton species were found in 340 lakes and ponds in southern Alberta and southeastern British Columbia, which ranged between 660-2455 m in elevation, had areas of less than 0.1-3940 hectares, were 0.5-136 m deep, and had saline concentrations of 2-29,000 ppm. Of these, 32 were copepods, 50 cladocerans, and 9 anostracans. Predator-prey relationships, competition, permanence of water body, heat, and extremes in salinity were the most important factors influencing distribution of species. Only two species were present in more than half the lakes and ponds. The number of species per community increased with complexity of habitat. The most common and abundant species tolerated a wide range of conditions and showed up to a five-fold variation in generation time. High alpine lakes and ponds and highly saline prairie lakes had few crustacean species but similar genera. (Buchanan-Davidson-Wisconsin)
W75-07310

EH STATUS OF LAKE SEDIMENT-WATER SYSTEMS IN RELATION TO NITROGEN TRANSFORMATIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
D. A. Graetz, D. R. Keeney, and R. B. Aspiras.
Limnology and Oceanography, Vol 18, No 6, p 908-917, 1973. 2 fig, 5 tab, 33 ref, EPA 16010 EHR.

Descriptors: *Oxidation-reduction potential, *Lake sediments, *Sediment-water interfaces, *Nitrogen, Ammonia, Nitrification, Nitrates, Denitrification, Wisconsin, Cycling nutrients.
Identifiers: Lake Mendota(Wis), Lake Wingra(Wis), Lake Tomahawk(Wis).

The results of this investigation indicate that in situ Eh measurements in sediment-water systems will give a reliable qualitative description of the overall oxidizing-reducing conditions in the systems. Large Plexiglas columns were used to evaluate the changes in the forms and amounts of nitrogen in the bottom waters and sediments of three freshwater lakes during stratified (anoxic) and turnover (aerated) conditions. Sampling ports and permanently placed black Pt electrodes were installed so that water and sediment phases could be monitored Sediment Eh declined rapidly from +150 to -250 mV and remained at this level irrespective of the oxygen concentration in the overlying water. During anoxic conditions, ammonium-nitrogen was released to the water at a relatively constant rate. Aeration affected rapid nitrification. Nitrate in the overlying water decreased with time, possibly due to diffusion into the highly reduced sediment and subsequent denitrification. Although the concentrations of a particular ionic species in these sediments was not enough to have controlling effect on the Eh, the presence of large amounts of oxidized Fe did seem to slow the rate of decrease, as noted in Tomahawk and Mendota sediments. (Jones-Wisconsin)
W75-07311

EFFECT OF MAN'S ACTIVITIES ON DISTRIBUTION OF TRACE ELEMENTS IN SUB-BOTTOM SEDIMENTS OF LAKE GEORGE, NEW YORK,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
M. Schoettle, and G. M. Friedman.
Sedimentology, Vol 21, p 473-478, 1974. (FWI Report No 73-14, Contribution No 164 from the Eastern Deciduous Forest Biome, IBP, November 1974). 5 fig, 3 ref. NSF AG-199, AEC 40-193-69.

Descriptors: *Bottom sediments, *Distribution, *Trace elements, Carbon, Copper, Zinc, Chromium, Iron, Sedimentology, Mesotrophy, Oligotrophy, Organic matter.
Identifiers: *Lake George(NY).

To determine the effects of man's activities on the lake bottom sediments of Lake George, cores were removed from the southern mesotrophic basin and from the northern oligotrophic basin. The southern core did not reach relict glacial sediment, indicating a thicker layer of organic rich clay; there the concentration of trace elements was lower, and all the trace elements were concentrated near the top of the core. The increased trace elements in the southern core sediments was not paralleled by an increase in organic carbon. In the northern core, the concentration of trace elements (copper, zinc, chromium, and iron) was almost constant throughout the core with the exception of manganese, which was concentrated near the core surface. Relict glacial clays contained much less organic carbon than modern clays. Man's activities in the watershed surrounding the southern basin caused increased concentrations of the trace elements studied in the newly deposited bottom sediments. The greater concentration of trace elements in the northern basin was probably caused by differences in the bedrock. Organic matter in Lake George sediments was much higher than in Lake Michigan sediments. (Buchanan-Davidson-Wisconsin)
W75-07312

CLEANER, THE LAKE GEORGE MODEL,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
R. A. Park, D. Scavia, and N. L. Clesceri.
IBP, Eastern Deciduous Forest Biome Contribution No 186. (Undated). 31 p, 13 fig, 1 tab, 23 ref.

Descriptors: *Ecosystems, *Computer models, Trophic level, Competition, Planning, Nutrients, Lakes, Nannoplankton, Aquatic animals, Fish food organisms, Insects, Aquatic plants, Aquatic algae, Fish, Sediments, Organic matter, Biomass, Nitrogen, Phosphates, Phytoplankton, Zooplankton.
Identifiers: CLEANER Model, Lake George(N.Y.).

CLEANER (Comprehensive Lake Ecosystem Analyzer for Environmental Resources), an ecosystem model based on the International Biological Program model CLEAN, can be used for environmental management. It represents functional physiological and ecologic relationships for major ecosystem compartments (blue-green algae, nannophytoplankton, herbivorous cladocerans, nutrients, net phytoplankton, herbivorous copepods, omnivorous zooplankton, bluegill-like fish, bass-like fish, carp-like fish, benthic insects, decomposers, macrophytes, suspended organic matter, and sedimented organic matter), with disaggregation of trophic levels for study of competition among dissimilar forms. The choice of compartments modeled was based on a consideration of the principal modes of resource utilization and ecologic interaction found in the Lake George, New York ecosystem. It is easily calibrated, has a broad scope, few data requirements, and interactive capability with user-oriented output. It is a one dimensional model without physical mixing terms, but can be coupled with hydrodynamic models. CLEANER can be used to study ecological relationships, guide data collection, provide scenarios, extract relationships between pollutants and ecosystem effects, educate, examine environmental trade-offs and impacts, and determine critical values of pollutants. CLEANER can eventually be combined with other models (WTRSHD, POPUL, and economic models) to predict nutrient loading and tourist response, permitting simulation of long range environmental, social, and economic impacts. (Buchanan-Davidson-Wisconsin)
W75-07313

LAKE KEURUSSELKA, PHYSICAL AND CHEMICAL PROPERTIES OF WATER, PHYTOPLANKTON, ZOOPLANKTON AND FISHES,

Jyvaskyla Univ. (Finland). Dept. of Biology.
P. Eloranta.

Aqua Fennica, p 18-43, 1973. 28 fig, 7 tab, 34 ref.

Descriptors: *Physical properties, *Chemical properties, *Phytoplankton, *Zooplankton, *Fisheries, Biological communities, Domestic wastes, Eutrophication, Humus, Color, Biomass, Limiting factors, Light intensity, Vertical migration.
Identifiers: *Lake Keurusselka(Finland).

The water quality of Lake Keurusselka, Finland is especially affected by the water discharging from bog areas at the lake's northern end and by the domestic wastes from Keuruu and Kolho. Thus, many zones can be delineated in the lake on the basis of the physical and chemical properties. The phytoplankton studies show that great areas of the lake are eutrophic due to domestic waste effluents. The high humic content and the darkness of the waters result in a reduction in the number of species in spite of eutrophication. The zooplankton biomass was very great although most of the species were indicative of oligotrophy or were indifferent to the trophic degree. The large biomass of Limnocalanus macrurus throughout the summer attests to the absence of predators especially vendace. It was difficult to determine clear diurnal vertical migrations of zooplankton as a result of different light intensities. The fish studies indicated great variations in the structure and mean sizes of the fish stock as well as differences in the compositions of the size and age classes in some areas of the lake. (Jones-Wisconsin)
W75-07314

PHOSPHORUS SOURCES AND TRANSPORT IN AN AGRICULTURAL RIVER BASIN OF LAKE ERIE,

Heidelberg Coll., Tiffin, Ohio. Dept. of Biology.
D. B. Baker, and J. W. Kramer.

In: Proceedings 16th Conference Great Lakes Research, p 858-871, 1973. 6 fig, 6 tab, 14 ref.

Descriptors: *Water pollution sources, *Phosphorus, *Agricultural runoff, *River basins, *Lake Erie, Ohio, Eutrophication, Land use, Measurement, Nutrient removal.
Identifiers: Sandusky River(Ohio), Point sources, Diffuse sources.

The contribution of phosphorus from point sources and diffuse sources to the Sandusky River were examined. The mean annual export of total phosphorus from a portion of the Sandusky River Basin was determined to be 454 metric tons. Annual point source inputs of phosphorus within the study area were observed to be 118 metric tons. Assuming all point source phosphorus leaves the system, a minimum diffuse source component of the output would be 336 metric tons or 74% of the total output. This represents a diffuse phosphorus loading coefficient of 103 kg/yr/sq km, a value 2.4 times as large as the 44 kg/yr/sq km which is used to calculate rural runoff in much of Lake Erie Basin. It is suggested that the diffuse source loading coefficient should represent a eutrophication index related to land use. The reduction of phosphorus loading into Lake Erie from diffuse sources will require comprehensive land use planning and implementation in the entire Lake Erie Basin. Reduced values for the diffuse phosphorus loading coefficient, corrected for annual variations in runoff, would provide a measure of progress towards less eutrophic land use management. (Jones-Wisconsin)
W75-07315

PHOSPHORUS DYNAMICS IN PONDS,

Alabama Agricultural Experiment Station, Auburn.
C. E. Boyd.

In: Proceedings of 25th Annual Conference of the Southeastern Association of Game and Fish Commissioners, p 418-426, 1971. 1 fig, 53 ref.

Descriptors: *Phosphorus, *Farm ponds, *Fish farming, Cycles, Absorption, Cycling nutrients, Fertilization, Bottom sediments, Aquatic plants, Food chains.
Identifiers: *Fish ponds.

The sources and sinks of phosphorus are discussed in relation to the fertility of fish ponds. Particular attention is given to phosphorus dynamics, P forms in water, P depletion, phosphorus availability in sediment, utilization of sediment phosphorus by macrophytes, phosphorus accumulation by aquatic plants, trophic transfers, and phosphorus losses. A qualitative model of the phosphorus dynamics in a fish pond is presented. Most ofthe possible inputs, transfers, and losses are likely important in infertile, unfertilized ponds. The sediments probably regulates the phosphorus status of most unfertilized ponds. Furthermore, the native fertility of ponds is directly related to the fertility of underlaying and surrounding soil. Fertilization is probably the only significant phosphorus input to well-managed ponds and where the sediment acts as a phosphorus sink. The use of fertilization in controlling macrophytes by encouraging phytoplankton which release P more quickly is advocated. Phosphorus transfers from water to phytoplankton and finally to fish are of major significance. Considerable P losses from fertilized ponds are due to sediment uptake, seepage, and fish harvest. Once sediments become saturated with phosphorus, equilibrium concentrations will probably increase to a level where the fertilization rates can be lowered. (Jones-Wisconsin)
W75-07316

LAKE TUUSULA DESTRATIFICATION AND AERATION TEST, WINTER 1972/73,

National Water Board of Finland, Helsinki.
J. Keto, and P. Seppanen.

Aqua Fennica, p 126-136, 1973. 6 fig, 3 tab, 4 ref.

Descriptors: *Water pollution treatment, *Destratification, *Aeration, Sewage effluents, Oxygen sag, Hypolimnion, Nutrients, Technology, Agricultural runoff, Phosphorus, Mechanical equipment, Estimated costs, Freezing, Oxygenation, Turbidity, Nitrogen.
Identifiers: *Lake Tuusula(Finland).

Study of the present state and prospects for improvement of Lake Tuusula, Finland indicates that the primary long-term requirement is to stop flow of all sewage and farming effluents into it. Owing to its critical oxygen state in late winter, either the lake must be aerated, or else hypolimnion water rich in nutrients must be drained as a short-term remedy. The typical N and P load is aggrevated by intensive cultivation in the watershed and sewage effluents released directly into the lake. The first aeration test in Lake Tuusula was made in winter 1969-70 by aerating the water and returning it to the desired depth without destratifying the lake. The purpose of the trials described was to test equipment and to prepare cost estimates. As the test proceeded, the vertical differences in oxygen were found to grow; by mid-March the difference of oxygen content between the surface and bottom averaged 0.5 mg oxygen per liter. The test seems to have been very successful in increasing the quantity of oxygen in Lake Tuusula. Even in a very cold winter, the equipment can be expected to sustain a good oxygen state. (Jones-Wisconsin)
W75-07317

SECRETION OF DISSOLVED ORGANIC CARBON AND NITROGEN BY AQUATIC MACROPHYTES,

R. G. Wetzel, and B. A. Manny.

Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 162-170, 1972. 8 fig, 2 tab, 14 ref.

Descriptors: *Carbon, *Nitrogen, *Aquatic plants, Organic matter, Adsorption, Eutrophication, Metabolism, Submerged plants, Floating plants, Michigan, Hardness(Water).
Identifiers: *Dissolved organic carbon, Dissolved organic matter, Lawrence Lake(Michigan), Najas flexilis, Lemna perpusilla.

Cyclic interactions of dissolved organic matter with inorganic nutrients are important in regulation of pelagic productivity and eutrophication. Preliminary studies examined the dissolved organic carbon and nitrogen components of secreted dissolved organic matter by a submersed and a floating-leaved macrophyte. An ultraviolet combustion technique was used to fractionate the dissolved organic carbon and dissolved organic nitrogen into UV-labile and UV-refractory components. Macrophytic sources of dissolved organic carbon and dissolved organic nitrogen are discussed and compared with estimates of allochthonous sources entering hardwater Lawrence Lake, Michigan. Najas flexilis and axenic Lemna perpusilla were used. The C/N ratio and secreted organic matter was 11:4 for total dissolved organic carbon and dissolved organic nitrogen produced by Najas in bicarbonate buffered media. This ratio was used in estimates of dissolved organic nitrogen produced by submersed littoral flora. Secretion of organic substrates by Lemna perpusilla was very low when the carbon sources was atmospheric carbon dioxide or aqueous carbonic acid. Lemna perpusilla utilizes both atmospheric and aqueous carbon. Decomposition rates of dissolved organic carbon secreted by Lemna were slower and contained more UV-refractory organic compounds than dissolved organic carbon secreted by Najas. (Jones-Wisconsin)
W75-07318

WATER QUALITY, NUTRIENTS, AND NET PLANKTON ANALYSIS OF SUMMERSVILLE LAKE,

West Virginia Univ., Morgantown. Dept. of Biology.
B. D. Lorenz.

Proceedings West Virginia Academy of Science, Vol 45, No 2, p 146-154, 1973. 5 fig, 1 tab, 15 ref.

Descriptors: *Chemical properties, *Nutrients, *Plankton, West Virginia, Nitrates, Phosphates, Reservoirs, Seasonal, Distribution, Copepods, Crustaceans, Rotifers, Algae, Daphnia, Mesotrophy.
Identifiers: *Summersville Lake(West Virginia), *Net plankton.

Concentrations and seasonal variation in the levels of nitrate and molybdate reactive orthophosphate, species composition and seasonal abundance of net plankton populations, and the trophic status of Summerville Lake were determined. Sampling was conducted on a semimonthly basis at a point near the dam. Chemical analysis involved the determination of nitrate and molybdate reactive orthophosphate. Net plankton samples were counted and identified to the species level. The mean concentration of nitrate in the top twenty meters during the stratification period was 2.1 mg/l. The mean concentration of molybdate reactive orthophosphate in the top twenty meters during the same period was 8.5 microgram/l. The net plankton community consisted primarily of copepods, cladocerans, rotifers, and non-filamentous green algae with copepods constituting the major portion. Seasonal alternation was apparent between the cyclopoid copepods, Cyclops bicuspidatus thomasi and Mesocyclops edax, the latter becoming common during early summer. Seasonal succession of four species of Daphnia was also observed during the investigation. Flood conditions resulting from Hurricane Agnes exerted an obvious effect on all biological and chemical parameters investigated. On the basis of nutrient concentrations and species composition, Summersville Lake appears to be mesotrophic. (Jones-Wisconsin)
W75-07319

BIOTIC INTERACTIONS BETWEEN DIFFERENT SPECIES OF ALGAE,
Auburn Univ., Alabama. Dept. of Fisheries and Allied Aquaculture.
C. E. Boyd.
Journal of the Weed Science Society of America, Vol 21, No 1, p 32-37, 1973. 7 tab, 22 ref.

Descriptors: *Algae, *Inhibitors, Chlorophyta, Cyanophyta, Plant growth, Anabaena.
Identifiers: Oscillatoria rubescens, Anabaena flos-aquae, Microcystis aeruginosa, Coccochloris peniocystis.

Circumstantial evidence indicates that inhibitory substances of algal origin likely play an important role in development of algal flora in many natural waters. Influence of one species upon growth of a second species was evaluated by procedure used by Proctor and Vance. Two species were grown in combination and individually. Any significant increase or decrease in growth of one species in a two-species combination, as compared to its growth in a single-species culture, was attributed to influence of the second species. Species of green algae seldom grew as well in two-species cultures with other green algae, or with blue-green algae, as when cultured alone. Several species of algae apparently excreted one or more substances into the medium which inhibited growth of the second species. Inhibition of growth of green algae was particularly great in two-species cultures with the blue-green algae, Oscillatoria rubescens, Anabaena flos-aquae, Microcystis aeruginosa, and Coccochloris peniocystis. Green algae failed to grow at normal rates in media prepared from filtrates of water from ponds which contained blue-green algae blooms. Inhibitory substances are apparently an important factor in development and persistence of relatively unialgal blooms of various species. (Jones-Wisconsin)
W75-07320

SEASONAL DISTRIBUTION, COMPOSITION, AND ABUNDANCE OF ZOOPLANKTON IN ONTARIO WATERS OF LAKE ST. CLAIR,
Lake Erie Fisheries Research Station, Wheatly (Ontario).
J. H. Leach.
International Association Great Lakes Research, Proceedings 16th Conference Great Lakes Research, p 54-64, 1973. 6 fig, 6 tab, 22 ref.

Descriptors: *Seasonal, *Distribution, *Zooplankton, *Lake Ontario, Rotifers, Copepods, Eutrophication, Crustaceans, Biological communities, Daphnia, Protozoa, Varieties, Water temperature.
Identifiers: *Lake St. Clair(Ontario).

Information collected between April and November 1972 on the distribution, abundance, and species composition of zooplankton in the Ontario waters of Lake St. Clair is reported. Zooplankton samples were collected twice monthly by oblique hauls from near bottom to the surface from 12 stations. Rotifers were numerically dominant with Keratella cochlearis and Polyarthra vulgaris the most numerous species. Four cyclopoid and eight calanoid copepods species were found. Cyclops bicuspidatus thomasi was the most abundant copepode, but it was exceeded by Cyclops vernalis in the most eutrophic area. Diaptomus ashlandi and Diaptomus minutus were the dominant calanoid copepods. Twenty-two species of cladocerans were found with Bosmina longirostris and Daphnia retrocurva the most abundant. Mean zooplankton abundance increased from 160 individuals/l in the northwest to almost 1000 individuals/l in the southeastern part of the lake and was related to both temperature and chlorophyll-a content. The distribution of phaeopigments was not significantly related to that of total zooplankton, although a relationship between phaeopigments and both rotifers and cladocerans was evident. In shallow Lake St. Clair it is likely that resuspended sediments are contributing to phaeopigment content. (Jones-Wisconsin)
W75-07321

EFFECT OF INTERACTIONS BETWEEN TEMPERATURE AND NITRATE SUPPLY ON THE CELL-DIVISION RATES OF TWO MARINE PHYTOFLAGELLATES,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. H. Thomas, and A. N. Dodson.
Marine Biology, Vol 24, No 3, p 213-217, 1974. 3 fig, 1 tab, 18 ref. NSF GA 32529X.

Descriptors: *Temperature, *Nitrates, *Reproduction, *Dinoflagellates, Nutrients, Gymnodinium, Marine algae, Growth rates.
Identifiers: Dunaliella.

Because sea water temperature varies horizontally and vertically, interactions between temperature and a limiting nutrient may have important ecological consequences on the growth of marine phytoplankton, Dunaliella and Gymnodinium splendens. Growth curves for Dunaliella showed a lag in cell division at 15C, but exponential growth occurred at 25C the first day following nitrate inoculation. Growth of G. splendens was erratic: exponential growth occurred immediately at 18C, but at 25C growth rates were difficult to calculate at low nitrate levels; nevertheless there was a growth response to nitrate concentration. Half saturation constants and maximum cell division rates were determined at two temperatures for nitrate limited growth of these phytoflagellates, using batch culture techniques. The half saturation constant increased with increasing temperature. Cells growing at a higher temperature have higher requirements for a limiting nutrient. Maximum cell division rates increased with increasing temperature in G. splendens but not in Dunaliella. The results suggest that changes in the half saturation constant with temperature impose a double stress on these phytoplankton when they grow in nitrate-depleted, high-temperature water. The success of dinoflagellates compared to diatoms in offshore water may be due to their vertical motility, to high nitrate and low temperature water. (Buchanan-Davidson-Wisconsin)
W75-07322

SPATIAL AND SEASONAL VARIATIONS IN PHYTOPLANKTONIC PRIMARY PRODUCTION AND BIOMASS IN THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND,
Helsinki Univ (Finland). Dept. of Botany.
K. Ilmavirta, and A.-L. Kotimaa.
Annales Botanici Fennici, Vol 11, No 2, p 112-120, 1974. 6 fig, 43 ref.

Descriptors: *Primary productivity, *Variability, *Seasonal, *Phytoplankton, Biomass, Lakes, Oligotrophy, Diatoms, Pyrrophyta, Spatial distribution, Dominant organisms.
Identifiers: *Lake Paajarvi(Finland), Cryptophyceae.

The chemistry, primary production, and phytoplankton biomass were studied in the mesohumic, oligotrophic Lake Paajarvi, Finland, from 1970-1971. Chemical variations were negligible. During the ice-free period there was no marked decrease in inorganic carbon and no increase in oxygen saturation, but during thermal stratification the hypolimnetic oxygen concentration decreased slightly, however, the oxygen depth curve remained orthograde. When ice-covered, the oxygen saturation percentage dropped in the 12-14 m layer. When primary production was low during the winter, the concentration of inorganic carbon was higher and hydrogen ion concentration values lower than in summer. Small phytoplankton biomasses during winter caused low potassium permanganate values and slightly higher nitrogen concentrations. Production decreased during ice cover, and maximum production occurred when stratification was most stable in July and August. The biomass began to increase after the break-up of ice, reaching a maximum in May-July and could be correlated with phytoplankton production. Biomass levels below the ice were low. The dominant phytoplankton group was Pyrrophyta; the Cryptophyceae species, Chroomonas acuta and Cryptomonas erosa most abundant. Seasonal variations of biomass showed that Cryptophyceae dominated in winter, spring, and early summer; Diatomae in autumn; and Chlorophyta and Cyanophyta remained low all year. (Buchanan-Davidson-Wisconsin)
W75-07323

STUDIES ON THE EFFECT OF ETHYLENEDIAMINE TETRAACETIC ACID (EDTA) ON THE METAL NUTRITION OF MARINE ALGAE,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
W. R. Taylor, and J. L. Taft.
Progress report September 1, 1972 - June 30, 1973. 24 p, 6 fig, 1 tab, 27 ref.

Descriptors: *Chemical reaction, *Acids, *Nutrient requirements, *Marine algae, Chelation, Trace elements, Cations.
Identifiers: *Ethylenediaminetetraacetic acid, Monochrysis lutheri, EDTA.

Algal trace metal requirements and algal growth enhancement with the metal chelator ethylenediaminetetraacetic acid (EDTA) were examined in a chelate-free defined medium, CF-1, using Monochrysis lutheri in axenic batch cultures. This study attempted to test the validity of a previously developed model and to further investigate the role of EDTA in algal nutrition. Results indicate an initial uptake of carbon-14 by the organisms and a subsequent dilution of the label with respect to nitrogen. To test the hypothesis that EDTA incorporation is concentration dependent, a series of duplicate cultures were prepared. Cells grew in all cultures except those containing 1860 micromoles EDTA. The uptake rate was highest during the first two hours. A constant, but lower, uptake rate was observed after 22 and 94 hours. Results indicate that Cu is not toxic to M. lutheri in the complexed form and confirms, for this organism, that growth is enhanced with EDTA when a metal is present in toxic concentrations. The significance of EDTA in algal growth enhancement has been attributed to its metal buffering capacity. However, EDTA induced alterations in cell membrane permeability may cause physiological alterations as yet unreported for planktonic algae. (Jones-Wisconsin)
W75-07324

THE FEEDING BEHAVIOR OF THE COPEPODS IN THE CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
S. E. Storms, and W. R. Taylor.
Progress report September 1, 1972 - June 30, 1973. 20 p, 6 fig, 1 tab, 8 ref.

Descriptors: *Feeding rates, *Copepods, *Chesapeake Bay, Zooplankton, Digestion, Herbivores, Food webs, Algae.
Identifiers: Acartia tonsa, Acartia clausi, Eurytemora effinis.

Two copepod species, Acartia tonsa and A. clausi, form a major portion of the Chesapeake Bay zooplankton: A. tonsa predominates most of the year, but during the winter months A. clausi also becomes numerous. As herbivores, these copepods represent an important link in the estuarine food web, and because of their abundance, are suspected of being the dominant organisms in their trophic level. Feeding experiments were run on stations along the main channel including one approximately 10 miles from mouth. Ingestion rates for mid-bay stations in December

1972 were highest in the 8-16 micron dimeter range of algal cells, which coincided with the range in which the highest cell concentrations occurred. Acartia tonsa was the only copepod present in the December experiments. Ingestion rates were generally lower during experiments run in February 1973. At the upper bay station, the phytoplankton concentration was greatest in the 6 micron range, and Eurytemora affinis displayed its highest ingestion rate in that size range, although ingestion remained high in the 6-12 micron range. Using regression equation for converting cell volume to cell organic carbon content in phytoplankton other than diatoms, the mean organic carbon ingestion rate was 0.83 micrograms carbon/animal/day. (Jones-Wisconsin)
W75-07325

THE RECYCLING OF PHOSPHORUS IN THE CHESAPEAKE BAY ESTUARY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. L. Taft, and W. R. Taylor.
Progress report September 1, 1972 - June 30, 1973. 19 p, 6 fig, 1 tab, 9 ref.

Descriptors: *Cycling nutrients, *Phosphorus, *Chesapeake Bay, *Estuaries, Phytoplankton, Zooplankton, Detritus.

The rate of phosphorus exhange between soluble reactive (DIP), particulate, dissolved organic (DOP) and poly (POLY P) phosphorus nutrient pools in Chesapeake Bay was investigated. Preliminary results are reported. Methods used for determination of DIP, DOP, and POLY P were adaptations of those in Strickland and Parsons (1968). Data were collected concurrently for nitrogenous plant nutrients, particulate nitrogen, silicate, alkalinity, oxygen, chlorophyll, temperature, pH, salinity and incident radiation. At three stations in February, experiments were conducted to estimate the rate and nature of phosphorus release by freshly captured zooplankton. Transport coefficients for P-32 into the particulate fraction were computed to eliminate the contribution of detrital phosphorus and to permit comparison with nitrogen transport and carbon assimilation. Two patterns of phosphorus exchange predominate. DIP-32 was assimilated into the particulate fraction at a constant rate. After 23 hours 70% of the P-32 was particulate. At the same station in February, DIP-32 was assimilated rapidly during the first five hours and more slowly thereafter. After 22 hours, 90% of the P-32 was particulate. Only 5% or less of the P-32 was contained in DOP or POLY P fractions at the end of each experiment. (Jones-Wisconsin)
W75-07326

THE NITROGEN-TO-PHOSPHORUS RATIO IN THE PHOTIC ZONE OF THE SEA AND THE ELEMENTAL COMPOSITION OF PLANKTON,
Washington Univ., Seattle, Dept. of Oceanography.
K. Banse.
Available from the National Technical Information Service, Springfield, Va. 22161 as RLO 2225T2618, $4.00 in paper copy; $2.25 in microfiche. (1972), 11 p, 1 fig, 18 ref. AT(45-1)-2225.

Descriptors: *Phosphates, *Nitrogen, *Euphotic zone, *Sea water, Absorption, *Phytoplankton, Nitrogen compounds, Suspended load, Seston, Zooplankton.
Identifiers: Nitrogen:phosphorus ratio.

The ratio of disappearance of inorganic nitrogen and phosphate from the photic layer of sea water cannot be expected to be correlated with the elemental ratio of uptake or assimilation by newly formed phytoplankton or suspended particulate matter. The ratio of nitrogen and phosphate ion disappearance from water represents the net result of removal into various particulate pools (phytoplankton, zooplankton, and non-living particulate matter (seston) and pools of dissolved organic nitrogen and phosphorus, and release from any of these pools into the inorganic pools of these elements. Only some of the rates of these processes can be correlated. The ratio of net removal of the elements from the water may not necessarily represent the ratio of uptake or assimilation by the phytoplankton or flux into the other seston pools. Also the ratio of concentrations of the elements in water mixed into the upper layer from below may shift and change the ratio of net change in the upper layer. (Buchanan-Davidson-Wisconsin)
W75-07328

AMCHITKA BIOENVIRONMENTAL PROGRAM: FRESHWATER VERTEBRATE AND INVERTEBRATE ECOLOGY OF AMCHITKA ISLAND, ALASKA. FINAL SUMMARY REPORT AND PROGRESS REPORT,
Utah State Univ., Logan.
J. M. Neuhold, W. T. Helm, and R. A. Valdez.
Available from the National Technical Information Service, Springfield, Va 22161 as BMI-171-154, $5.45 in paper copy, $2.25 in microfiche. Batelle, Columbus Laboratories, Ohio, Report BMI-171-154, June 1974. 43 p, 13 fig, 11 tab, 33 ref, append.

Descriptors: *Environmental effects, *Nuclear explosions, *Ecosystems, Underground, Food chains, Ponds, Streams, Aquatic animals, Aquatic plants, Salmonids, Sculpin, Pink salmon, Sockeye salmon, Sticklebacks, Primary productivity, Anadramous fish.
Identifiers: *Amchitka Island(Alaska), *Dolly Varden.

Dolly Varden and threespine stickleback were the most abundant and well-distributed of the six freshwater species of fishes encountered on Amchitka. There were small runs of pink salmon and a limited distribution of coho salmon and freshwater Aleutian sculpin. Two underground nuclear tests affected local populations of fishes with deaths in threespine stickleback due to test-induced pressure changes occurring within 2,000 m from site zero (SZ). The only loss of Dolly Varden resulted from watershed and pond alterations that drained streams and ponds. More widespread and persistent effects on freshwater biota resulted from pretest construction and drilling activities. Detectable changes in fish and invertebrate populations resulted in four streams near the four drill sites from increased siltation and from the release of drilling residue. (Katz)
W75-07338

THE FATE AND BEHAVIOR OF CRUDE OIL ON MARINE LIFE,
Massachusetts Univ., Gloucester. Marine Station.
C. S. Yentsch, E. S. Gilfillan, and J. R. Sears.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 584, $4.25 in paper copy, $2.25 in microfiche. June 1973. 62 p, 34 fig, 2 tab, 10 ref. DOT-CG-13992-A.

Descriptors: *Crude oil, *Bioindicators, *Respiration, *Monitoring, *Marine animals, *Marine plants, Water quality, Water pollution effects, Metabolism, Oil, Chemical analysis, Mussels, Algae, Salinity, Stress, Animal physiology, Feeding rates, Clams, Emulsions, Dehydration.
Identifiers: *Mytilus edulis, *Carbon budget.

The objective was to evaluate the feasibility of using physiological responses of marine organisms as quantitative indicators of low petroleum hydrocarbon concentrations. Results indicate that physiological responses of selected test organisms to low level petroleum concentrations are not suitable for monitoring purposes. None of the crude oils used were acutely toxic to selected marine plants and animals, but responses of the animals indicate that sea-water extracts of crude oils can have severe metabolic effects. Plants were found to be more resistant to oil pollution than animals. (Katz)
W75-07339

STUDY OF IMPORTANCE OF BACKWATER CHUTES TO A RIVERINE FISHERY,
Southern Illinois Univ., Carbondale. Fisheries Research Lab.
H. L. Schramm, Jr., and W. M. Lewis.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 544, $6.25 in paper copy, $2.25 in microfiche. Prepared for Army Engineer Waterways Experiment Station, August 1974. 144 p, 3 fig, 13 tab, 153 ref.

Descriptors: *Reviews, *Rivers, Physiochemical properties, Fishes, River systems, *Mississippi River, *Backwater, *Environmental effects, Mississippi River Basin, Turbidity, Dissolved oxygen, Channels, Freshwater fish, Benthos, Bass, Catfishes, Sunfishes.
Identifiers: *Environmental effects, *Side channels.

A comprehensive review was made of the literature to determine the environmental impact of the loss of backwater areas in connection with proposed changes in the channel of the Mississippi River between St. Louis, Missouri, and Cairo, Illinois. The review covered two general areas: literature pertaining to the physical, chemical and biotic factors of larger rivers, and literature pertaining to the biology of the fishes recorded as present in the section of concern in the Mississippi River. Only a limited amount of data has been published. The direct effects of the physiochemical factors (current, turbidity, substrate, and dissolved oxygen were examined. Based on the literature, it was concluded that extra-channel areas provided the most favorable conditions of existence for the fishes recorded as present in the study area. (Extra-channel areas include the complex of habitats classified as side-channels, river lakes and ponds, and sloughs.) Identification is made of those specific fish that would and those that would not be affected by the hypothetical physiochemical conditions that would prevail following the loss or alteration of the extra-channel areas. (Katz)
W75-07340

RESPONSE OF SALT MARSH BIVALVES TO ENRICHMENT WITH METAL-CONTAINING SEWAGE SLUDGE AND RETENTION OF LEAD, ZINC, AND CADMIUM BY MARSH SEDIMENTS,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
I. Valiela, M. D. Banus, and J. M. Teal.
Environmental Pollution, Vol 7, No 2, p 149-157, September 1974. 1 fig, 6 tab, 21 ref.

Descriptors: *Lead, *Cadmium, *Zinc, *Sewage sludge, *Salt marshes, *Mussels, Heavy metals, Tidal marshes, Mollusks, Shellfish, Benthos, Oysters, Commercial shellfish, Environmental effects, Growth rates, Fertilizers, Absorption, Water pollution effects.
Identifiers: *Mercenaria mercenaria, *Crassostrea virginica, *Modiolus demissus, Bioaccumulation.

Growth in Mercenaria mercenaria and Crassostrea virginica, bivalves found in tidal creeks in salt marshes on the coast of the NW Atlantic, was not affected by experimental additions of metal-containing sewage sludge and urea fertilizers to salt marsh plots. Modiolus demissus, a mussel inhabiting the marsh surface itself, did grow better under the same fertilizer treatments. All three species of shellfish showed no increases in lead or zinc contents, but all showed increased cadmium contents related to the sludge fertilizer treatments. Increases in zinc, and particularly in cadmium, but not lead, were detected in the creek bottom detritus downstream from the plots. The surface

sediment of the marsh plots shows significant accumulation of all three metals. The calculation of input-output budgets shows that lead was trapped in the sediments with virtually no losses to deeper waters. Zinc and cadmium also accumulated in the sediments but there is some transport away from the salt marsh surface, especially in the case of cadmium. (Katz)
W75-07341

FORMALIN AS A THERAPEUTANT IN FISH CULTURE,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
R. A. Schnick.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 198, $5.75 in paper copy, $2.25 in microfiche. Fish and Wildlife Service, April 1973. 131 p, 7 tab, 222 ref.

Descriptors: *Aquiculture, *Fungicides, *Fish eggs, *Fish diseases, Fish parasites, Pesticides, Standards, Toxicity, Pesticide residues, Trematodes, Crustaceans, *Reviews, *Bibliographies.
Identifiers: *Formalin.

Formalin is the most effective and widely used therapeutant and prophylactant for the control of fungus on fish eggs and external parasites on fish. It has not been registered for these uses by the regulatory agencies. Fish culturists cannot legally use this chemical on fish consumed for food. This paper was written to support the initiation of the registration procedure for formalin. Literature from 1909 was analyzed for information on the efficacy, toxicity and residues of formalin in connection with its use in the aquatic environment. There is evidence that formalin is safe for use on some marine and many freshwater fishes and is effective in controlling and preventing fungus on fish eggs and certain external parasites on fish. Used properly, formalin is not a hazard to applicators nor harmful to fish. A method is available to detect residues in fish. (Katz)
W75-07342

5D. Waste Treatment Processes

BACTERIAL DEGRADATION OF ARYLSULFONATES IN TREATMENT OF WASTEWATER,
Maryland Univ., College Park. Dept. of Microbiology.
T. M. Cook, K. I. Braunschweiger, and L. A. More.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 280, $4.75 in paper copy, $2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No 31, (1975). 73 p, 14 fig, 3 tab, 24 ref, 5 append. OWRT A-020-MD(1), 14-31-0001-3520.

Descriptors: *Detergents, *Biodegradation, *Waste water treatment, *Linear alkylate sulfonates, *Maryland, Respiration, Bacteria, Sewage treatment, *Biological treatment, Sulfonates, Alkylbenzene sulfonates, Pseudomonas.
Identifiers: River die-away test, Bacterial respiration, *Patuxent River(Md), Arylsulfonates, Moraxella species.

The river die-away test was used to study biodegradation of linear alkylbenzene sulfonates (LAS) detergents in natural waters. Samples of water from the Patuxent River at various seasons of the year contained organisms capable of degrading sodium dodecylbenzene sulfonate (DBS). Two pure cultures of LAS degraders were isolated; the culture from sewage was tentatively identified as a moraxella species and the culture from river water as a Pseudomonas species. The two cultures were shown to produce greater than 95% degradation of LAS added to culture media. Both cultures degraded dodecylbenzene sulfonate; they were also able to degrade the non-aromatic surfactant, sodium dodecylsulfate, but not the branched-chain ABS detergent. The two LAS degraders produced significant growth with butyl-, pentyl-, hexyl- and heptylbenzene sulfonate; colorimetric tests showed degradation of the octyl-, dodecyl-, tridecyl-, tetradecyl- and pentadecylbenzene sulfonates. In the shake-flask procedure using a medium containing yeast extract and LAS, the detergent was degraded by 96% in 8 days. In a mineral salts medium with LAS (10 microgram/ml), degradation of 75% or more occurred in 2 days. Cells grown on acetate or glutamate oxidized hexylbenzene sulfonate or DBS at rates comparable to that of cells grown on hexylbenzene sulfonate. With hexylbenzene sulfonate as substrate there was no detectable accumulation in the medium of either sulfite or sulfate. Cells grown on hexylbenzene sulfonate showed oxygen uptake with hexylbenzene sulfonate of DBS, but not catechol. Comparison of the amount of growth produced on hexylbenzene sulfonate and acetate indicated a 1 to 2 mole relationship.
W75-06852

A NOVEL BLEACHING PROCESS FOR REMOVAL OF COLOR AND TOXICITY FROM BLEACH PLANT EFFLUENT,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
W. A. Moy, K. Sharpe, and R. G. Betz.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 75-80, 11 tab, 23 ref.

Descriptors: *Color, *Toxicity, *Bleaching wastes, *Pulp wastes, Water pollution sources, Industrial wastes, Wastes, Water consumption, Pulp and paper industry, Water costs, Costs, Steam, Chemicals, Effluents, Sodium compounds, Calcium compounds, Water conservation, Chlorine compounds, Chlorine, *Waste water treatment.
Identifiers: Semibleached pulp, Kraft pulp, Newsprint, Sodium hypochlorite, Calcium hypochlorite.

A bleaching sequence capable of producing semibleached kraft pulp suitable for use in newsprint is discussed. It includes a sodium hypochlorite first stage, followed by a mild caustic extraction, and a calcium hypochlorite third stage. Through use of this sequence, instead of the more typical chlorine/hot caustic extraction stages, effluent color was reduced by 90%. The effluent was nontoxic, and fresh water usage was reduced. Improvement of pulp yield and reduced water and steam costs are said to offset increased chemical cost. The modified bleaching sequence was a superior alternative to other systems for effluent color reduction. (Hansen-IPC)
W75-06861

THE IMPLEMENTATION OF A POLLUTION CONTROL SYSTEM AT THE ONTARIO PAPER COMPANY LIMITED,
J. T. Charlton, W. F. Fell, and A. Y. Yau.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 47-53, 3 fig, 1 tab, 2 ref.

Descriptors: Pollution abatement, *Sulfite liquors, *Waste water treatment, *Pulp wastes, Industrial wastes, Water pollution sources, Foaming, Color, *Biochemical oxygen demand, *Evaporators, Water quality control, *Incineration, Wastes, Capital costs, Costs, Pollutants, Treatment facilities, *Canada.
Identifiers: Copeland recovery process, Eimco belt washers.

A system was designed and installed at Ontario Paper Co. Ltd.'s Thorold, Ontario, mill to collect and incinerate waste liquors from the sulfite pulping and chemical recovery operations. The sulfite liquor recovery system employs horizontal-type belt washers (also known as 'Extractors') supplied by Eimco Envirotech Ltd. (Toronto), and the incineration system consists of evaporators, a Copeland fluidized-bed reactor, and auxiliary equipment. The primary purpose of the $8,270,000 system is to eliminate the foam and color originating at this mill and to reduce the 5-day BOD loading. Although these objective have not yet been completely reached, there has been a significant improvement. Some light foam still forms in the receiving stream but does not persist. It probably is caused by the remaining spent sulfite liquor not yet processed. The 5-day BOD in the evaporator condensate averages about 500 mg/liter. The BOD remaining in the effluent is, however, still 40% of that generated in the pulping process, its bulk being spent sulfite liquor not yet recovered or burned. The problem of evaporator instability when using mixed alcohol plant effluent and spent sulfite liquor needs to be solved before the objectives of BOD reduction can be reached. (Witt-IPC)
W75-06862

ORGANIZING FOR TODAY'S EFFLUENT CONTROL NEEDS,
Intercontinental Pulp Co. Ltd., Prince George (British Columbia).
G. A. Decker, and S. Louie.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 133-137, 5 fig, 2 tab, 2 ref.

Descriptors: *Water pollution control, *Pulp wastes, *Bleaching wastes, *Air pollution, Water reuse, Water pollution sources, Industrial wastes, Sewage treatment, Biological treatment, Pulp and paper industry, Odor, Labor, Personnel, Education, Operation and maintenance, Monitoring, Effluents, Oxidation, *Waste water treatment, *Canada.
Identifiers: Evaporator condensates, Turpentine, Black liquor, Precipitators, Kraft mills.

Antipollution systems and equipment installed at Intercontinental Pulp Co.'s mill in British Columbia are described briefly. The mill, a joint venture by Canadian Forest Products of Vancouver, British Columbia, the Reed Paper Group of London, England, and Feldmuehle AG. of West Germany, produces about 600 tons/day of kraft pulp. In-plant measures include equipment for maximum reuse of process waters, fiber and chemical reclaim systems, and monitoring of effluent quality. Mill and bleach plant effluents are subjected to secondary treatment by a biological process. Air pollution control equipment includes a pre-oxidizer scrubber for foul evaporator condensates, turpentine decanter underflow and blow line vents; a weak black liquor oxidation system in conjunction with an odor control unit for gases scrubbed from bleach plant effluents and a wet bottom precipitator on the rocovery stack. It is emphasized that systems such as these will not produce the desired results unless they are operated properly, and instances of operator failure are cited. The steps taken to educate employees in the correct use of the facilities are discussed. (Hansen-IPC)
W75-06863

PROBLEMS OF WASTE WATER PURIFICATION IN DIFFERENT PH RANGES (PROBLEME DER ABWASSERREINIGUNG IN UNTERSCHIEDLICHEN PH-BEREICHEN),
C. H. Mobius.
Translation available from IPC, Appleton at $7.50. English translation of Wochenblatt fur Papierfabrikation, Vol 102, No 23/24, p 897-900, December 15, 1974. 2 fig, 26 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Flocculation, *Hydrogen ion concentration, Zeta potential, Coagulation, Neutralization, Colloids, Acidity, Alkalinity, Organic matter, Clays, Montmorillonite, Biological treatment, Water purification, Water pollution sources, Water pollution treatment, Pulp and paper industry, Wastes, Industrial wastes, Waste treatment, Water quality control, Effluents.
Identifiers: Alum, Alkaline sizing, Paper coating effluents, Paper sizing effluents.

This discussion is restricted to chemical flocculation. The effect of pH on zeta-potential is discussed, as well as coagulation by charge neutralization. The destabilization of protective colloids (e.g., starch) is considered. Acid effluents (pH 4.5-6.5) are easily coagulated. Neutral effluents (pH 6.5-7.5) frequently occur in paper and board manufacture and can be treated like acid effluents, using more alum. Basic effluents (pH over 7.5) arise from coating operations and from alkaline sizing. These can not always be coagulated simply with alum; the difficulty here is frequently the presence of protective colloids, and special techniques are discussed. Dissolved organic materials can be partly removed by addition of absorptive substances like sodium montmorillonite, but further biological or physical purification treatments are usually needed. (Ward-IPC)
W75-06864

A PRELIMINARY REVIEW OF ANALYTICAL METHODS FOR THE DETERMINATION OF SUSPENDED SOLIDS IN PAPER INDUSTRY EFFLUENTS FOR COMPLIANCE WITH EPA-NPDES PERMIT TERMS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5A.
W75-06865

THE TREATMENT OF EFFLUENT IN THE PAPER INDUSTRY. SOME CONSIDERATIONS ON THE EQUIPMENT USED,
H. Verbrugge.
Translation available from IPC, Appleton at $7.50. English translation of La Technique de l'Eau, No 310, p 23-26, October, 1972. 13 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Equipment, *Treatment facilities, Sewage treatment, Screens, Pulp and paper industry, Activated sludge, Biological treatment, Aeration, Aerated lagoons, Sludge treatment, Dewatering, Filtration, Centrifugation, Incineration, Settling basins, Reviews, Translations.
Identifiers: Sand remover, Surface aerators, Rotary brush, Grab screen.

The principal processes and equipment used in treating paper industry effluents are reviewed. Both primary treatment (screening, sand removal, primary settling) and secondary treatment (activated sludge treatment with aeration plus secondary settling, aerated lagoon treatment, and sludge thickening, filtration, centrifugation, and incineration) and covered. Detailed diagrams and illustrations are included of a rectangular sand remover, grab screen, primary settling tanks, an activated sludge system, aerated lagoon treatment, floating surface aerator, vortex surface aerator, rotary brush, secondary settling tank, and a sludge thickener. (Speckhard-IPC)
W75-06866

PRIMARY EFFLUENT TREATMENT AT NORTHWOOD (PULP AND TIMBER LTD.),
Northwood Pulp and Timber Ltd., Prince George (British Columbia).
W. G. Lim.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 109-111, 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Pulp wastes, *Treatment facilities, *Sewage treatment, Waste treatment, Pulp and paper industry, Water purification, Filters, Sludge, Sludge disposal, Performance, Pumping, Operations, Water pollution sources, Filtration, Industrial wastes, Design criteria, Industrial plants, Canada.
Identifiers: Eimco clarifier, Eimcobelt gravity filters, Rietz sludge press.

A bleached softwood kraft mill in British Columbia started up in mid-1966 with only secondary effluent treatment. Despite the design features which were incorporated in the mill to minimize losses to the sewers, secondary treatment alone was inadequate, and it was necessary to add primary treatment facilities. The design criteria and physical layout of this system, which includes pumping station, Eimco clarifier, Eimcobelt gravity filters, Rietz sludge press, and sludge disposal, are described. Performance data and operating problems, along with their solutions, are given. (Hansen-IPC)
W75-06868

OPERATING PERFORMANCE OF WASTE TREATMENT SYSTEMS FOR A LINERBOARD MILL,
A. Graham.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 63-70, 3 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Treatment facilities, *Operations, Sewage treatment, Aerated lagoons, Biochemical oxygen demand, Suspended solids, Industrial wastes, Water pollution control, Waste treatment, Pulp and paper industry, Water pollution sources, Water pollution treatment, Performance, *Canada.
Identifiers: Linerboard, Board mills, Kraft mills.

An effluent treatment system installed at an integrated high-yield kraft linerboard mill is described in detail. It provides for primary and secondary treatment of combined effluents, followed by final treatment in aerated lagoons. Data for 18 months of operation are given. BOD reduction has averaged about 75%, and suspended solids reduction about 25%. (Hansen-IPC)
W75-06869

TOXICITY REMOVAL FROM KRAFT BLEACHERY EFFLUENT USINAG A TWO-STAGE ACTIVATED SLUDGE SYSTEM,
Environmental Protection Service, Burlington, (Ontario). Wastewater Technology Centre.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 125-131. 4 fig, 5 tab, 6 ref.

Descriptors: *Bleaching wastes, *Activated sludge, *Toxicity, *Waste water treatment, Water pollution sources, Industrial wastes, Pulp and paper industry, Waste treatment, Rainbow trout, Fish, Biochemical oxygen demand, Legislation, Pulp wastes, Wastes, Pilot plants, Treatment facilities, Water quality, Water pollution treatment, Biological treatment, Solids contact processes, *Canada.

A pilot-scale two-stage activated sludge system was used to treat kraft bleachery effluent at Eddy Forest Products Ltd., Espanola, Ontario. For comparison, a conventionally loaded single-stage system was operated in parallel with the two-stage system. Emphasis was placed on assessment and comparison of the capabilities of the activated sludge systems for the reduction of acute toxicity to juvenile rainbow trout. Process efficiencies were determined and engineering design parameters developed. The pilot-scale results showed that the two-stage system was capable of greater toxicity reduction than the single-stage system. At similar volumetric loadings the two-stage system also provided greater BOD reduction than the single-stage system. Effluents from neither system met toxicity requirements of the 1971 Canadian Pulp and Paper Effluent Regulations, but areas where further research is appropriate are identified, and recommendations for additional work are given. (Hansen-IPC)
W75-06871

OPERATING CHARACTERISTICS OF A PAPER MILL PRIMARY CLARIFIER,
Scott Paper Co., Westbrook, Maine. S. D. Warren Div.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 31-35. 7 fig.

Descriptors: *Pulp wastes, *Treatment facilities, Pulp and paper industry, *Operations, Waste water treatment, Water purification, Water pollution sources, Industrial wastes, Wastes, Waste treatment, Sludge, Settling velocity, Suspended solids, Chemical precipitation, Flocculation, Effluents, Industrial plants, Pollution abatement, Water pollution control, *Maine, New England.
Identifiers: Dorr-Oliver clarifier, *Presumpscot River(Maine).

The treatment of effluents from S. D. Warren Co.'s Westbrook, Maine, integrated pulp and paper mill is discussed. The mill produces about 300 tons/day of bleached kraft pulp and 600 tons/day of coated printing and specialty papers. Effluents from the paper mill are treated in a 180-ft diameter Dorr-Oliver primary clarifier with a clay and sand bottom. It is designed to treat 15 million gal/day and is presently treating 9 million gal/day with a surface settling rate of 354 gal/sq ft/day, a weir overflow rate of 16,000 gal/ft/day, a retention time of 8.5 hr, and sludge removal rate of 540 gal/min at an average consistency of 2.5-3.0% solids. Treatment efficiencies have averaged better than 99% removal of settleable solids, and 85% removal of suspended solids. Flocculants have been evaluated, and when used, have increased the suspended solids removal efficiency to as much as 99% . The fiber content of the sludge is presently 40-45%. Major problems encountered have been associated with sludge withdrawal, principally due to the size and location of the sludge lines. Effluents are presently being discharged to the Presumpscot River, but will eventually be treated, in compliance with current regulations, in an activated sludge secondary treatment plant now under construction. (Witt-IPC)
W75-06872

DEWATERING OF EXCESS ACTIVATED SLUDGE AT THE SYASYA INTEGRATED PULP AND PAPER MILL (OBEZVOZHIVANIE IZBYTOCHNOGO ILA NA SYAS'KOM KOMBINATE),
Syasskii Lesokhimicheskii Kombinat (USSR).
Bumazhnaya Promyshlennost, No 11, p 23-24, November, 1974.

Descriptors: *Activated sludge, *Dewatering, Treatment facilities, *Sludge treatment, Coagulation, Lime, Filtration, Filters, Fertilizers, Crops, Industrial wastes, Wastes, Sludge disposal, *Waste water treatment, Water pollution sources, Water pollution control, Pollutants, Aeration, Mixing, Foreign countries, Landfills.
Identifiers: Ferric chloride, Vacuum filters, USSR.

A description is given of the sludge dewatering process at the Syasya pulp and paper mill. Excess sludge from the aeration tank, at a concentration of 5-7 g/liter, is transferred to two thickeners

where it is concentrated within 8-12 hr to 20-30 g/liter. The sludge is then transferred to an aerated blow-off chamber, where it remains 2-3 hr. The sludge is then pumped to a pressure tank and then to a mixing chamber where it is treated with coagulants (ferric chloride and lime). It is then filtered on vacuum filters. The dewatered sludge, containing 80-83% water, is disposed of in a landfill or used for fertilization of agricultural crops. The installation is not yet fully completed (it lacks a blender tank, primary sedimentation tanks, etc.), so that it is presently overloaded. However, its general performance has been satisfactory, and its efficiency should improve with some suggested modifications. (Stapinski-IPC)
W75-06875

INTEGRATED PURIFICATION OF EFFLUENTS FROM VISCOSE RAYON PRODUCTION USING ION EXCHANGE AND ELECTRODIALYSIS (K VOPROCU O KOMPLEKSNOI OCHISTKE STOCHNYKH VOD VISKOZNYKH PROIZVODSTV S PROMOSHCHIYU IONNOGO OBMENA I ELEKTRODIALIZA),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Iskusstvennogo Volokna, Leningrad (USSR). Leningradskii Filial.
Khimicheskie Volokna, No 4, p 70-71, 1974.

Descriptors: *Waste water treatment, *Ion exchange, *Electrodialysis, Textiles, Industrial wastes, Water pollution sources, Suspended solids, Gases, Cation adsorption, Calcium, Iron, Zinc, Metals, Sodium, Alkali metals, Alkaline earth metals, Organic matter, Sodium sulfate, Waste treatment, Wastes, Water pollution control, Pollution abatement, Water purification, Separation techniques, Water quality control, Sulfates.
Identifiers: *Viscose rayon, *USSR.

On the basis of an intensive study of the effluents from viscose rayon production, an integrated 5-stage process is recommended for the purification of such effluents. The acidic wastes are subjected to mechanical purification to remove suspended particles and dissolved gases, then are purified with ion-exchange resins. Zn, Ca, Fe, and other polyvalent cations are removed first. Resins in the H form are then used to remove Na ions. The third stage involves the removal of sulfate ions, the fourth stage the removal of organic material. The last stage is to remove those Na ions which are introduced during the regeneration of anion-exchange resins. A mixture of the eluates from the 2nd, 3rd, and 5th stages is sent to a unit for the recovery of sodium sulfate by electrodialysis. The first-stage eluate is used for Zn recovery, while the fourth-stage eluate is sent to biochemical purification. (Chern-IPC)
W75-06876

TWO-STAGE BIOLOGICAL PURIFICATION OF EFFLUENTS (L'EPURATION BIOLOGIQUE DES EAUX RESIDUAIRES EN DEUX PHASES),
Informations Chimie, No 112, p 75-79, October, 1972. 2 fig, 1 tab.

Descriptors: *Pulp wastes, *Biological treatment, *Treatment facilities, Bacteria, Fungi, Protozoa, Construction costs, Operating costs, Electric power demand, Flocculation, Suspended solids, Phosphates, Fibers(Plant), Biochemical oxygen demand, Water pollution sources, Wastes, Industrial wastes, Water pollution control, Pollution abatement, Foreign countries, Europe, Sedimentation, *Waste water treatment.
Identifiers: *Attisholz activated sludge process, Pollution load.

A description is given of the Attisholz system, developed by the Swiss Attisholz mill, for the biological purification of effluents. The system is based on different requirements of bacteria and fungi on one hand, and of protozoa on the other. In the first stage, a bacterial sludge is used, while a protozoan sludge used in the second stage serves to eliminate the bacteria and the remaining organic matter. The advantages of the process are compactness of the installation, low construction and operating costs, insensitivity to variations in the pollution load, low power consumption (especially at high degrees of purification), and considerable reduction of excess activated sludge. If necessary, the biological treatment is followed by chemical treatment to flocculate the remaining suspended solids and insoluble phosphates. The Attisholz process was studied at the Biberist mill under pilot-plant conditions in 1966, and an industrial installation was put into operation in 1967 for treatment of papermaking and paper coating effluents. In this installation (which is described) a third biological stage has been added, as well as a presedimentation tank for the recovery of fibers. The 5-day BOD reduction exceeds 90%. (Stapinski-IPC)
W75-06877

ENVIRONMENTAL PROTECTION AND ITS EFFECTS ON PRODUCTION CONDITIONS IN THE PULP AND PAPER INDUSTRY (UMWELTSCHUTZ UND SEINE AUSWIRKUNGEN AUF DIE PRODUKTIONSBEDINGUNGEN IN DER),
Allgemeine Papier-Rundschau, No 42, p 1174, 1176, 1178, 1180, 1182-1183, October 21, 1974.

Descriptors: *Pulp and paper industry, *Water reuse, *Industrial production, Corrosion, Deposition(Sediments), Recirculated water, Impaired water quality, Water conservation.

This discussion on environmental problems in the pulp and paper industry attempts to point out the need for a greater degree of closing of circulation systems and to examine, in particular, the complex nature of resulting deposit and corrosion problems. Processes leading to deposits and corrosion are considered along with counter measures. Emphasis is on the need for avoiding a one-sided approach in dealing with such problems. Only intensive cooperation of all the participants and consideration of all the factors involved will give an optimum solution. Precise recognition of the problems involved is especially important. (Speckhard-IPC)
W75-06878

ZURN-ATTISHOLZ SYSTEM IS CHOSEN BY WAUSAU (PAPER MILLS CO.) FOR PULP MILL EFFLUENT.
Paper Trade Journal, Vol 159, No 4, p 29-30, January 27, 1975. 1 fig, 1 tab.

Descriptors: *Treatment facilities, *Waste water treatment, *Pulp wastes, Water pollution sources, Industrial wastes, Wastes, Waste treatment, Sludge treatment, Sludge disposal, Activated sludge, Biological treatment, Water purification, Pollution abatement, Water pollution control, Effluents, Dewatering, Filtration, Landfills, Wisconsin.
Identifiers: *Zurn-Attisholz activated sludge process, *Wisconsin River(Wis.), Magnefite pulping, Vacuum filters.

A $4 million effluent treatment facility featuring a paper mill effluent clarifier and a Zurn-Attisholz (2-stage high-rate activated slude) system for treating pulp mill effluents will be installed by Wausau Paper Mills Co., Brokaw, Wis. The company produces 330 tons/day of fine papers and 186 tons/day of Magnefite hardwood pulp. The pH of the pulp mill sewer will be adjusted and the flow screened and pumped to the Zurn-Attisholz system. Sludge recycle equipment will be identical for the first and second stages. Sludge pits at the settler inlet will collect part of the sludge which is pumped to the aeration tank by air lifts; sludge from the main part of the tank will be removed by a suction scraper traveling bridge mechanism. Combined primary and secondary sludge will be dewatered on two vacuum filters, and filtrate and thickener overflow is piped to the Zurn-Attisholz influent sump. Filter cake will be disposed of as landfill, and effluent flows discharged to the Wisconsin River. (Sykes-IPC)
W75-06879

THE SSVL (STIFTELSEN SKOGSINDUSTRIERNAS VATTEN OCH LUFTVARDSFORSKING) ENVIRONMENTAL CARE PROJECT (OF THE SWEDISH FOREST PRODUCTS INDUSTRY): TECHNICAL SUMMARY.
Stiftelsen Skogsindustriernas Vatten och Luftvardsforsking (Stockholm), 1974, 286 p, 3 appendices.

Descriptors: *Pollution abatement, *Europe, *Pulp and paper industry, Water pollution control, Research and development, Air pollution, Foreign research, Foreign countries, Evaporation, Discharge(Water), Accidents, Sludge treatment, Sludge disposal, Chemical degradation, Biological treatment, Water pollution sources, Industrial wastes, Wastes, Water quality control, Waste treatment, Waste water treatment, Pulp wastes, Sulfite liquors.
Identifiers: *Forest products industry, Stiftelsen Skogsindustriernas Vatten och Luftvardsforsking, Pulp washing, Pulp screening, Bleach plants, Condensates, Kraft pulp mills, Sulfite pulp mills, Neutral sulfite semichemical pulp mills, Fiberboard mills.

During 1970-73, a survey of environmental pollution loads discharged by the Swedish pulp, paper, and fiberboard industries (which revealed the magnitude of the abatement problem) was followed by a review of available control technologies and several sub-project research and development studies on promising and economical emission reduction approaches. These investigations, summaries of which are appended, dealt with closure of paper mill water circuits and of the cooking-washing-screening system, the operation of bleach plants, evaporation and treatment of condensates, temporary and accidential discharges, sludge handling and disposal, biological and chemical effluent treatments, and air pollution problems. Water and atmospheric quality protection measures recommended for bleached and unbleached kraft, sulfite, and neutral sulfite semichemical pulp mills, as well as for paper and fiberboard mills, are discussed in the light of the various findings. (Brown-IPC)
W75-06880

MECHANISM OF LIGNIN REMOVAL IN ACTIVATED SLUDGE TREATMENT OF PULP MILL EFFLUENTS,
Toronto Univ. (Ontario).
Water Research, Vol 8, No 11, p 857-862, November, 1974. 5 fig, 3 tab, 4 ref.

Descriptors: *Pulp wastes, *Activated sludge, *Lignins, *Biological treatment, Sorption, Chemical reactions, Oxidation, Biodegradation, Microgial degradation, Water pollution sources, Industrial wastes, Wastes, *Waste water treatment, Proteins, Organic compounds, Pollutants, Water pollution treatment, Water purification, Sulfite liquors.
Identifiers: Alkali lignin, Lignosulfonates, Molecular weight.

Maximum lignin removals by activated sludge treatment of pulp mill effluents amounted to 15% for lignosulfonates and 70% for alkali lignin. The lower molecular weight lignosulfonates were preferentially removed, whereas alkali lignins of all molecular weights were removed rather uniformly. Only the high molecular weight fractions of both lignosulfonates and alkali lignin were sorbed on the protein zein. It is concluded that lignin removal during activated sludge treatment may occur by physical sorption, chemical oxidation and condensation, and biological degradation. (Buchanan-IPC)
W75-06885

(NOVA SCOTIA FOREST INDUSTRIES) PILOTS UNOX SYSTEM FOR SECONDARY TREATMENT (OF SULFITE AND NEWSPRINT MILL EFFLUENTS),
Nova Scotia Forest Industries, Port Hawkesbury.
Pulp and Paper Canada, Vol 76, No 2, p 67-72 (T32-36), February, 1975. 7 fig, 4 tab, 1 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Oxygen, *Biological treatment, *Sewage treatment, Pilot plants, Effluents, Sulfite liquors, Toxicity, Legislation, Sludge, Biochemical oxygen demand, Hydrogen ion concentration, Dissolved oxygen, Costs, Maintenance costs, Capital costs, Pulp and paper industry, Waste treatment, Water pollution sources, Fish, Aerobic conditions, Aerobic treatment, Water pollution control, Odor, Chemical oxygen demand.
Identifiers: *UNOX process.

UNOX is a high-rate biological process in which pure oxygen is used in place of air in a closed reactor under slight pressure. It was adopted for treating waste water from the Port Hawkesbury mill, because of its apparent advantages over conventional secondary treatment plants, such as reduced capital and maintenance costs, flexibility of operation, elimination of odor, and low space requirements. The system removed an average of 91% of the effluent's 5-day BOD and 40% of the COD, but the final effluent failed fish toxicity tests, partly because of heavy metal concentrations present and partly because of the need to raise the ammonia nutrient level from 6-8 to 40 ppm at times. (Gotman-IPC)
W75-06886

PHOTOCHEMICAL DECOLORIZATION OF PULP MILL EFFLUENTS,
Institute of Paper Chemistry, Appleton, Wis.
Tappi, Vol 58, No 2, p 130-133, February, 1975. 1 fig, 4 tab, 15 ref.

Descriptors: *Pulp wastes, *Color, *Ultraviolet radiation, Effluents, Waste water treatment, Sulfite liquors, Oxygen, Osication, Costs, Economics, Operating costs, Biochemical oxygen demand, Sodium compounds, Kinetics, Chemical reactions, Radiation, Solar radiation, Industrial wastes, Pollutants, Wastes, Water pollution sources, Water pollution control, Water quality control, Bleaching wastes.
Identifiers: Total organic carbon, Ketones, N-Bromosuccinimide, Hydrogen peroxide, Sodium hypochlorite, Bromine compounds, Oxidants.

The method of color removal described involves the oxidation of color bodies with oxygen in the presence of UV light. Reductions of BOD demand and total organic carbon occurred during the decolorization of unbleached kraft decker effluent, caustic extract from kraft pulp bleaching, and neutral sulfite semichemical pulp washings. Of the additives used to increase the process efficiency (such as ketones, N-bromo-succinimide, hydrogen peroxide, and NaOC1) the hypochlorite as the most effective. It extended the active wavelength range to 300 nm and longer, thus allowing the use of sunlight in lieu of mercury lamps. The addition of 0.1% NaOC1 enhanced the rate of decolorization by a factor of about 50 when using a medium-pressure mercury lamp. The method is capable of complete (100%) irreversible decolorization under laboratory conditions. It poses no chemical recovery or sludge handling problems, and its cost may be comparable to other new methods of color removal. (Gotman-IPC)
W75-06887

CHEMICAL SEDIMENTATION OF FOREST INDUSTRY WASTE WATERS (KEMISK FALLNING AV SKOGSINDUSTRIELLA AVLOPPSVATTEN),
Kemisk Tidskrift, Vol 86, No 7/8, p 54-56, 59, 1974. 8 fig, 3 tab.

Descriptors: *Pulp wastes, *Chemical precipitation, *Waste water treatment, Water purification, Separation techniques, Biological treatment, Waste treatment, Water pollution treatment, Wastes, Sludge, Industrial wastes, Pulp and paper industry, Chemicals, Flocculation, Water quality control, Aluminum, Sulfates.
Identifiers: Boliden AVR.

Processes and techniques used in the purification of pulp and paper mill effluents via chemical sedimentation are reviewed. Results obtained with an iron-containing aluminum sulfate preparation (Boliden AVR') are emphasized, including combination of the process with biological purification. Sludge handling is also discussed. (Speckhard-IPC)
W75-06888

BLEACHERY EFFLUENT TREATMENT,
K. V. Nayak, F. M. A. Nicolle, and J. A. Histed.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 19-25. 4 fig, 5 tab, 9 ref.

Descriptors: *Bleaching wastes, *Color, *Pulp and paper industry, *Waste water treatment, Water pollution sources, Industrial wastes, Wastes, Chemical precipitation, Lime, Calcium compounds, Sludge, Temperature, Lignins, Organic compounds, Pulp wastes, Effluents, Waste treatment, Pollutants, Pollution abatement, Chlorine, Chlorination.

Experiments on color removal from bleachery effluents are reported. It was found that when alkaline extraction stage effluent was mixed with concentrated chlorination effluent (obtained by extensive recycling of chlorination filtrate), a lignin-like precipitate was formed, with concurrent color reduction in the supernatant liquid. A 3-stage process involving this initial precipitation step, lime treatment of the supernatant liquid, and subsequent carbonation to remove excess lime, resulted in significant color reduction of the final effluent, with fairly rapid settling rates in the various stages. The treatment of combined effluents in the volume range of 1500 to 1720 gal/ton produced the best response with respect to decolorization efficiency. Increasing the temperature in the lime treatment stage improved the sludge settling rate. Under preferred conditions about 91% reduction in color was obtained with a lime consumption of about 20 lb (as CaO) per ton of pulp. (Hansen-IPC)
W75-06891

IN-PLANT REDUCTION OF SUSPENDED SOLIDS AT (EDDY FOREST PRODUCTS LTD.) ESPANOLA (ONTARIO),
Eddy Forest Products Ltd., Espanola (Ontario).
R. Thompson, P. J. Savage, and C. Y. Chai.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 9-11. 6 fig.

Descriptors: *Pulp wastes, *Suspended solids, *Pollution abatement, Biochemical oxygen demand, Water pollution sources, Effluents, Industrial wastes, Wastes, *Waste water treatment, Pollutants, Water quality control, Pulp and paper industry, *Canada.
Identifiers: Woodrooms, Spills, Pulp washing, White water(Paper machine), Kraft mills, Fiber recovery.

In-plant measures have been initiated at a Canadian bleached kraft pulp and paper mill to reduce the amount of suspended solids in the mill effluent. Equipment was installed to reduce suspended solids in the woodroom effluent, recover spills from the brown stock washers, and recover fiber from the paper machine drain water as well as from the wet ends of the pulp machines. Flow diagrams of the woodroom effluent treatment system, brown stock washer drain system, and fiber recovery system are given. Suspended solids have been reduced to 25% of their former amount, and the BOD load has been halved. (Witt-IPC)
W75-06892

WATER REUSE FROM THE BLEACHERY TO THE RECOVERY SYSTEM,
F. M. A. Nicolle, and J. A. Histed.
Candian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q), p 113-119. 6 fig, 7 tab, 15 ref.

Descriptors: *Bleaching wastes, *Water reuse, *Pulp and paper industry, Water conservation, Industrial wastes, Wastes, Laboratory tests, Recirculated water, Industrial water, Chemical precipitation, Calcium, Water pollution sources, Pollution abatement, Waste disposal, Chlorine, Chlorination.
Identifiers: Kraft pulp, Pulp screening, Pulp washing, Chlorine dioxide, Chemical recovery, Countercurrent processes.

Laboratory tests demonstrated the feasibility of using bleachery effluents for pulp screening and kraft brown stock washing. Countercurrent washing and extensive recycling of chlorination filtrate in the bleaching of softwood pulp by the D(C)EDED sequence was used to produce the concentrated effluents required for simulation of the effluent-free mill. Problems were encountered due to formation of a precipitate when chlorination filtrate was made alkaline. The cause of this precipitate has since been traced to an unusually high ash and calcium content in the unbleached pulp. Because of this precipitate the original flow system intended for simulation had to be modified to permit use of bleachery effluent on the brown stock washers. A workable flow system is presented, along with recommendations for disposal of excess bleachery effluents in other parts of the recovery process. (Hansen-IPC)
W75-06893

QUALITY OF PULP INDUSTRY WASTE WATERS AND THEIR USE FOR CROP IRRIGATION (IZSLEDVANE NA KACHESTVATA NA OTPAL'CHNITE VODI OT TSELULOZNATA PROMISHLENOST I IZPOLZUVANETO IM ZA NAPOYAVANE NA SELSKOSTOPANSKI KULTURI),
S. Sev, and I. Papazov.
Godishnik Visshiya Inzhenerno-Stroitelen Institut, Vol 23, No 1, p 75-84, 1971. 2 fig, 2 tab, 5 ref.

Descriptors: *Pulp wastes, *Irrigation water, *Crops, *Waste water disposal, *Water reuse, Industrial wastes, Wastes, Suspended solids, Sulfur compounds, Hydrogen sulfide, Chemical oxygen demand, Biochemical oxygen demand, Crop production, Crop response, Soils, Color, Toxicity, Lethal limit, Waste dilution, Sedimentation, Aeration, Oxidation, Potatoes, Sugar beets.
Identifiers: *Bulgaria.

Potatoes and feed beets were irrigated with unpurified effluents from the St. Kiradzhiev kraft mill. The effluents consisted of waste from kraft pulp manufacture, pulp screening and washing, and the kraft paper machine.They contained, on the average, 198.42 g/cu m of suspended solids, 420.56 g/liter dry solids, 13.04 g/liter sulfur compounds (methyl sulfide, dimethyl disulfide, hydrogen sulfide, and methyl mercaptan), and had a COD of 310.35 g/liter and a 5-day BOD of 143.74 g/liter. During the first season, irrigation increased the crop yield. However, continuous irrigation over a 3 year period caused a gradual reduction of the crop yield and a visible discoloration of the soil. This was apparently due to the presence of sulfur

compounds in the effluents and their gradual accumulation in the soil to toxic levels, and was more pronounced in heavy soils than in light sandy soils. The mill effluents can be used for irrigation provided their content of sulfur compounds is reduced to nontoxic levels either by suitable dilution or by passage through a horizontal sedimentation tank, a cascade aerator, and a sedimentation pond (this process results in oxidation of a large fraction of the sulfur compounds). (Stapinski-IPC)
W75-06895

CLARIFIER INSTALLATION IN AN INTEGRATED SULFITE AND NEWSPRINT MILL,
P. Veilleux.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 27-29. 3 fig.

Descriptors: *Water purification, *Treatment facilities, *Pulp wastes, Sulfite liquors, Pulp and paper industry, Wood wastes, Lime, Neutralization, Sludge treatment, Sludge disposal, Filtration, Dewatering, Incineration, Water pollution sources, Industrial wastes, Wastes, *Waste water treatment, Waste treatment, Pollution abatement, Water pollution control, Water quality control, *Canada, Landfills.
Identifiers: Woodrooms, Sulfite pulp mills, Newsprint mills.

The clarifier and related equipment installed at the Alma newsprint mill of Price Co. (Canada) is described. The effluent to be handled includes the combined discharges from the woodroom, sodium-base sulfite pulp mill, and paper mill, and includes some discharge from the mill sanitary sewers. The system provides for lime neutralization of wastes before clarification, and for thickening of sludge in a continuous filter, with final dewatering in a vertical V-press. The dewatered sludge is disposed of by trucking to a landfill site, with incineration in bark-burning boilers as a possible alternative. (Hansen-IPC)
W75-06931

BLEACH PLANT WATER REDUCTION,
O. K. Aschim, and K. C. Wiest.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 101-102. 4 tab.

Descriptors: *Water conservation, *Pulp and paper industry, *Bleaching wastes, Water consumption, Temperature, Foaming, Treatment facilities, Operations, Water quality control, Water pollution sources, Industrial water, *Canada, Chlorine, Chlorination.
Identifiers: *Bleach plants, Kraft pulp mills.

By raising the operating temperature in the chlorination stage from 70F to 120-130F, Prince Albert Pulp Co. was able to reduce fresh water consumption from 50,300 to 32,300 gal/ton at its softwood bleached kraft mill. Except that the more closed system resulted in increased defoamer requirements, no adverse effects have been observed. The reduction in water consumption has resulted in improved operation of the effluent treatment facilities. (Hansen-IPC)
W75-06932

CONSOLIDATED-BATHURST IN-PLANT POLLUTION ABATEMENT CONTROL SCHEME,
C. Dionne, M. Fraser, K. Godin, and G. A. Menier.
Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, Montreal, September 23-25, 1974, Preprinted Proceedings (Montreal, P.Q.), p 81-84. 6 fig.

Descriptors: *Pollution abatement, *Pulp wastes, *Suspended solids, *Biochemical oxygen demand, Legislation, Water reuse, Bark, Fibers(Plant), Pulp wastes, Effluents, Water pollution sources, Industrial wastes, Water pollution control, Reclamation, Industrial water, Recirculated water, Pollutants, *Canada.
Identifiers: White water, Spills, Fiber recovery.

The approaches used and projected by Consolidated-Bathurst Ltd. at several of its mills to control effluent suspended solids and BOD to meet Canadian Provincial and Federal Government Regulations are described. Areas in which substantial improvements have been made are white water reuse, bark fines reduction, centrifugal cleaner rejects reclamation, and spill recovery. Flow diagrams for the latter three systems are given. (Hansen-IPC)
W75-06933

EXPANDING WASTE WATER TREATMENT CONSIDERATIONS AT CORPS OF ENGINEERS RECREATION AREAS,
Army Engineer District, St. Louis, Mo.
E. E. Middleton.
Water Resources Bulletin, Vol 9, No 1, p 155-159, February 1973.

Descriptors: *Waste water treatment, *Recreation, *Projects, Operations, Lakes, Wastes, *Illinois, Engineering, Design, Waste treatment, Filtration, *Treatment facilities.
Identifiers: Extended aeration, Plant operators.

Through its recreation program, the Corps of Engineers is becoming more involved in the design and operation of waste water treatment plants. Over the past few years, there have been many changes in the waste water treatment requirements at St. Louis District Corps of Engineers projects. Discussed are the methods considered for treating these wastes. Septic tanks and oxidation pond or lagoon are among several possible methods, but extended aeration plant, followed by filtration, is the process used in most of the areas. The treatment plant operators have become key members of the project operation team. A discussion of the District's operator training program is presented along with the operator's job requirements. Through a Spring inspection of all treatment plants in the District, a mechanism has been provided for encouraging feedback to the design engineer from the operator. (Bell-Cornell)
W75-06941

A PRESENT VALUE-UNIT COST METHODOLOGY FOR EVALUATING MUNICIPAL WASTEWATER RECLAMATION AND DIRECT REUSE,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Sanitary Sciences Div.
V. J. Ciccone, M. L. Granstrom, S. L. Yu, and J. J. Seneca.
Water Resources Bulletin, Vol 11, No 1, p 21-32, February 1975. 4 fig, 4 tab, 16 ref.

Descriptors: *Water supply, *Water demand, Waste water(Pollution), *Reclamation, *Water reuse, *Alternative planning, *Methodology, *Cost analysis, Evaluation, Capital costs, Operating costs, Unit costs, Economies of scale, Value, Optimization, Waste water treatment, Comprehensive planning, Municipal water, Constraints, Decision making, Recycling, Mathematical models, Equations, Systems analysis, Water users.
Identifiers: Cost minimization.

A least cost evaluation model based on the Present Value-Unit Cost (PVUC) method is developed and applied to a hypothetical municipal water supply-wastewater treatment problem. Two basic considerations are involved: (1) meeting projected water demand over the planned horizon by construction and operation of a conventional storage and distribution facility, supplementing existing water sources by importation or new source development; and (2) instituting a dual system by recycling wastewaters for direct reuse to meet nonpotable projected demands and satisfy potable requirements from existing and secondary sources. A discriminant, which is the PVUC difference between the two alternatives, yields a decision input easily calculated. When applied over selected planning horizons, the discriminant predicts a cost equivalency of the two alternatives at some future point in time. The strategy employs given water demands, sources, geophysical parameters, and available selected advance wastewater treatment methods to evaluate the alternatives in a system which permits reclamation of treated wastewaters to desired quality. The reclaimed wastewaters are subsequently distributed to selected users categorized as industrial, commercial, and public. The projected water demands are exogenous constraints which must be satisfied. The cost functions which include capital and operating costs are constructed to reflect economies of scale. This approach is designed to permit a flexible and comprehensive analysis of alternative sources of water supply, allowing for a decision based upon least cost solutions to be made. (Bell-Cornell)
W75-06947

A GEOMETRIC PROGRAMMING MODEL FOR OPTIMAL ALLOCATION OF STREAM DISSOLVED OXYGEN,
Rensselaer Polytechnic Inst., Troy, N.Y.
J. G. Ecker.
Management Science, Vol 21, No 6, p 658-668, February 1975. 6 tab, 18 ref.

Descriptors: *Water quality control, *Dossolved oxygen, *Standards, *Streams, *Water policy, *Waste water treatment, *Pollution abatement, Annual costs, *Hudson River, Treatment facilities, Economics, Reach(Streams), Design, Equations, Constraints, Mathematical models, Systems analysis, Biochemical oxygen demand.
Identifiers: Geometric programming, Nonlinear programming, Waste discharge, Cost minimization, Continuous variables, Posynomial programming.

A nonlinear model is developed for allocating treatment requirements along a stream so as to meet stream dissolved oxygen standards at each point in the stream while minimizing the total annual cost of all discharging activities. An application of the model to several reaches of the Upper Hudson River is considered, and some alternative pollution abatement policies are analyzed. The crucial variables in the model are the removal rates of the individual processes which act in series to form the treatment plant. The actual design of the treatment plants as well as the total removal rate determined by the individual process removal rates are considered. Insight is given into the fixed charge aspect of the problem in that solutions to the model will be useful in determining whether or not certain processes should be included in the treatment plant design. However, the basic use of the model will be to determine the optimal operating levels for individual treatment processes in a fixed system design. Also, the model is particularly useful for sensitivity analyses involving changes in the characteristics of the stream and changes in stream standards. (Bell-Cornell)
W75-06954

A KINETIC MODEL FOR DESIGN OF COMPLETELY-MIXED ACTIVATED SLUDGE TREATING VARIABLE-STRENGTH INDUSTRIAL WASTEWATERS,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
C. E. Adams, W. W. Eckenfelder, and J. C. Hovious.
Water Research, Vol 9, No 1, p 37-42, January 1975. 4 fig, 1 tab, 5 ref.

Descriptors: Kinetics, *Industrial wastes, Waste water(Pollution), *Waste water treatment, *Water pollution control, *Activated sludge, Mathematical models, Equations, Biochemical oxygen demand, *Design, Operation and maintenance, Effluents, Organic loading, Systems analysis, *Treatment facilities.
Identifiers: Prediction, Influents.

A mathematical model is effectively employed to predict the performance of high and variable strength industrial wastes. The equation logically states that the overall removal rate decreases as the fraction of BOD remaining to be removed decreases. The rationale for this rests in the fact that the more readily removable compounds are exhausted, those yet to be removed result in a decreasing removal rate. This model and the supporting data infer that variations in influent organic strength will result in variations in effluent quality with a constant organic loading whereas existing models indicate little effect of influent on effluent. Consequently, a lower-than-normal organic loading will be necessitated at higher-than-average influent concentrations in order to maintain consistent effluent quality. The feasibility of operating such lightly loaded systems as well as the economic impact resulting from such a design will require evaluation for each concentrated waste. Proper use of the equation will not only allow optimization of the design, including delineating equalization requirements, but will also enable more effective operation by providing a method of calculating the required organic loading to maintain consistent effluent. (Bell-Cornell)
W75-06955

COST OF TRICKLING FILTER RECIRCULATION PART I,
C. R. Lee.
Water and Sewage Works, Vol 122, No 1, p 57-59, January 1975. 5 fig, 23 ref, append.

Descriptors: *Waste water treatment, *Trickling filters, *Cost analysis, *Design, Optimization, Operation and maintenance, Amortization, Annual, Pumping, Equations, Mathematical models, Systems analysis.
Identifiers: Recirculation flow, Recirculation ratio.

The trickling filter has been one of the most commonly used processes for wastewater treatment. Many mathematical models capable of designing the desired effluent have been developed. Problems still arise in designing the recirculation flow configuration and ratio using these methods. The recirculation ratio of the trickling filter ranges from 0.5 to 3.0. Questions arise in the optimal design concerning costs, sensitivity of design variables, and improvement of treatment efficiency. Discussed are design formulae for flow configurations and treatment conditions proposed by Eckenfelder and by the National Research Council. Shown are Eckenfelder's plug-flow type formula and complete-mixing type formula. Reviewed are cost analyses of waste treatment. Operation and maintenance (O.M.) cost is taken as an evaluation of the optimum design. The O.M. cost here is the sum of the annual operation and maintenance cost and the amortization cost. The models used to calculate the costs of trickling filter and pumping systems are shown in the appendix. From these models, the total O.M. cost and the optimum design cost for various cases may be found. Results indicate the optimal cost will be compromised by the two opposite trends of the pumping cost and the filter cost, when the recirculation ratio increases. (See also W75-06957) (Bell-Cornell)
W75-06956

COST OF TRICKLING FILTER RECIRCULATION PART II,
C. R. Lee, and T. Takamatsa.
Water and Sewage Works, Vol 122, No 2, p 64-66, February 1975. 3 fig, 1 tab, 23 ref, append.

Descriptors: *Waste water treatment, *Trickling filters, *Design, Cost analysis, Optimization, Flow rates, Wastes, Temperature, Operation and maintenance, Effects, Pumping, Equations, Mathematical models, Systems analysis, *Operating costs, *Maintenance costs.
Identifiers: Removal efficiency, Recirculation ratio.

The total operation and maintenance (O.M.) cost of a trickling filter with a recirculation system is taken as an evaluation of the optimum design. The total O.M. cost calculated by using Eckenfelder's formula is generally lower than that calculated by the National Research Council formula. The recirculation ratio, which makes the required volume of the filter minimal, will not be the optimal design, when pumping cost is taken into consideration. The optimal designs of the two formulas show quite a discrepancy due to the recirculation ratio and the flow rate. By Eckenfelder's formula, the deeper filter is more economical than the shallower filter, within 10 ft. depth. The temperature effect is greater at higher removal efficiency, and the differences of the total O.M. cost due to the temperature variations are greater at lower temperatures. In most cases, the recirculation will improve the filter performances but will not necessarily be an economical design if the total O.M. cost is considered. Especially, by Eckenfelder's formula, when a high degree of treatment is required, the recirculation will not improve the filter performance, until the recirculation ratio increases beyond the critical zone. (See also W75-06956) (Bell-Cornell)
W75-06957

VARIATION OF URBAN RUNOFF QUALITY AND QUANTITY WITH DURATION AND INTENSITY OF STORMS--PHASE III,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5B.
W75-06975

CORRESPONDENCE CONFERENCE ON REMOVAL OF NITROGEN FROM MUNICIPAL WASTEWATER,
Massachusetts Univ., Amherst. Water Resources Research Center.
B. B. Berger.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 378, $3.25 in paper copy, $2.25 in microfiche. Publication No. 48 - Completion Report FY-75-3, March 1975, 18 p. OWRT A-059-MASS(1). 14-31-0001-4021.

Descriptors: *Education, *Conferences, Methodology, *Waste water treatment, *Nitrogen, Training, Municipal water, *Information exchange.
Identifiers: Correspondence conferences, *Information transfer.

This project had three objectives: a test of the effectiveness of information transfer through a correspondence 'at home' conference, the gaining of experience for preparation of guides utilizing correspondence conferences in a long-term program of continuing education, and more specifically in this case a transfer of knowledge on new and emerging techniques in removal of nitrogen from municipal wastewaters. This proposed technique of information transfer seeks to avoid the major expense and inconvenience of conventional specialty conference attendance, while enabling the participants to extract a maximum of benefit through personal participation in such conferences. A set of six papers, each dealing with an important phase of nitrogen removal from municipal wastewater and each prepared by an authority in the field was sent to 67 registrants. Each registrant was given an opportunity to direct two series of questions through the conference staff to each author. The major conclusions are that correspondence conferences can provide an effective way to transfer information and they can be considered as a desirable supplement to conventional specialty conferences.
W75-06984

STUDIES ON THE HYDROLYSIS AND PRECIPITATION OF ALUMINUM (III),
Ohio State Univ., Columbus. Dept. of Civil Engineering.
A. J. Rubin, and P. L. Hayden.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 318, $5.25 in paper copy, $2.25 in microfiche. Completion Report No. 364X, April 1973. 91 p, 20 fig, 19 tab, 108 ref. OWRT A-016-OHIO(1).

Descriptors: *Chemistry of precipitation, *Aluminum, *Waste water treatment, *Hydrolysis, *Coagulation, Aqueous solutions, Metals, Alkalis(Bases).

Results are described of an extensive and systematic investigation of the aqueous chemistry of aluminum(III). Hydrolytic species were identified and their formation constants determined using computed analysis of potentiometric data. Aluminum hydroxide precipitates were defined by several experimental techniques including precipitate boundary analysis of light scattering data. Crystal structures were identified by x-ray diffraction measurements. A hydrosol formed in acid solutions up to OH/Al ratios of 3.0. Precipitation experiments conducted in nitrate, chlorine, sulfate and phosphate media indicated that the solubility and colloidal stability of the condensed phase is greatly affected by the type and concentration of anion present as well as solution age. Comparison of pH-concentration limits of solubility and stability with published coagulation data indicates a very close agreement. Apparently, precipitation of insoluble hydroxide is an important factor in the chemical coagulation process when using hydrolyzing metals such as aluminum(III).
W75-06988

DEVELOPMENT OF MICRO-SCALE LABORATORY FILTRATION TECHNIQUES,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
J. C. Burdick, III, W. A. Drewry, and L. D. Watson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 334, $3.75 in paper copy, $2.25 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report No. 41, December 1974. 32 p, 10 fig, 8 tab, 9 ref, append. $3.00. OWRT A-033-TENN(1). 14-31-0001-4043.

Descriptors: *Filtration, *Analytical techniques, *Laboratory tests, *Waste water treatment, *Sludge treatment, Equipment, Design, Activated sludge, *Filters.
Identifiers: *Micro-scale filtration procedures.

The need exists for developing micro-scale techniques in order to investigate vacuum filtration in the laboratory to provide design parameters for full-scale plant use. The results of tests conducted indicate that similar values for the mean specific resistance and filter yields can be obtained by using small scale units; consequently, the volume of sludge required for determining these parameters can be greatly reduced to amounts that can be obtained from laboratory activated sludge units. The practical limit for the filter leaf area appears to be above 0.004 sq ft to obtain consistently reliable results. This is due to the observation that a significant difference occurred between the mean filter yields of the standard leaf apparatus and the 0.004 sq ft leaf apparatus for the Third Creek conditioned sludge. Variables that need to be more closely controlled include sludge temperature, vacuum, filter area, and the time of filtration

after the addition of FeCl3. Based upon these preliminary results, detailed consideration on micro-scale procedures for water plant sludges appears to offer a valuable alternative to existing procedures.
W75-06990

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. VI, SIMULATION, OBSERVATION, AND STATE ESTIMATION,
New York City-Rand Inst., N.Y.
For primary bibliographic entry see Field 5B.
W75-07042

CHEMICAL ANALYSIS FOR EVALUATION OF SOIL SORPTION PROPERTIES,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
For primary bibliographic entry see Field 5B.
W75-07058

WATER AND SEWERAGE DEVELOPMENT PLAN - KANSAS CITY METROPOLITAN REGION.
Metropolitan Planning Commission-Kansas City Region, Mo.
1971. 130 p, 21 fig, 26 tab.

Descriptors: *Sewerage, Drainage systems, Water control, Utilities, *Water management(Applied), *Planning, *Urban drainage, Basins, Water resources development, *Land use, Water quality, Project planning, Zoning, *Missouri, *Kansas, Regional development, Cities.
Identifiers: *Kansas City Metropolitan Region(Mo-Kan).

Policies, plans and implementation tactics of water and sewerage systems in the eight county region of metropolitan Kansas City are described. To meet the regional goal of sufficient utilities for all present and potential users, a water and sewerage plan is developed which meets desired quality standards, uses watershed as basis for systems, identifies areas of future growth and suggests adequate facilities to meet demands, encourages adoption and enforcement of zoning and subdivision regulations and recommends the control of supply by central water distribution systems. A detailed inventory of natural physical data in the area provides the constraints and criteria for establishing facility priorities. As the demands and future growth patterns of each county are assessed, water and sewerage facilities can be planned to be coordinated with land use development for a workable regional program. Success of facilities and systems plans requires intergovernmental and interagency cooperation as well as support of the general public. Maps for each county detail separately a general water plan and a general sewer plan. (Salzman-North Carolina)
W75-07083

REPORT ON REGIONAL POLLUTION CONTROL: HALIFAX-DARTMOUTH METROPOLITAN AREA.
Halifax-Dartmouth Metropolitan Area Planning Committee (Nova Scotia). Task Group on Water Supply and Waste Disposal.
Prepared for Metropolitan Area Planning Committee, Halifax-Dartmouth, Nova Scotia, November, 1971. 14 p, 1 tab, 3 append.

Descriptors: *Sewerage, *Sewage treatment, *Sewage districts, *Pollution control, *Construction costs, *Cost analysis, Sewers, Planning, *Canada, Regional development.
Identifiers: *Halifax-Dartmouth Metropolitan Area(Nova Scotia), Regional sewerage system.

Alternatives for pollution control of the Halifax-Dartmouth Metropolitan Area and recommendations for a regional sewage collection and treatment system for the city of Halifax, part of Dartmouth, and the Herring Cove area of Halifax County are presented. Basic assumptions are presented for time horizon to year 2000; treatment requirements by type of waste, and outflow location (65% BOD for Halifax Harbour sanitary waste), and tunnel capacity (4 times dry weather flow in year 2000). Sewage treatment alternatives are broken down into area subsections. Seven sewage treatment plant sites are reviewed for the regional system resulting in eight combined alternatives. Costs are based on E.N.R. Index of 1300 and thus not representative of today's costs but are viable for comparison purposes. Estimates for alternatives are given. While 3 alternatives are equal in capital costs, 2 have high operating costs, $8.41 and $9.35 million versus $6.6 million, resulting in the recommendation of a single plant coordinated system possibly at the Hen and Chickens shoal for the regional system instead of a fragmented system requiring 4 plants. Investigation of potential effects on the harbour is also recommended. (Park-North Carolina)
W75-07085

RESEARCH NEEDS RELATED TO HYDROMETEOROLOGIC ASPECTS OF FUTURE ENERGY PRODUCTION,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 6D.
W75-07094

RESEARCH NEEDS RELATED TO HEAT DISSIPATION FROM LARGE POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W75-07095

EFFLUENT TREATMENT AND ITS COST FOR THE SYNTHANE COAL-TO-SNG PROCESS,
Bureau of Mines, Pittsburgh, Pa.
J. P. Strakey, Jr., A. J. Forney, W. P. Haynes, and K. D. Plants.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign, Research Report No. 93, p 169-178, November, 1974. 4 tab, 6 ref.

Descriptors: *Coals, *Environmental effects, *Energy, *Environmental control, *Waste treatment, Energy conversion, Sulfur, Nitrogen compounds, Ponding, Recycling, Air pollution, *Costs.
Identifiers: SYNTHANE Coal-to-SNG process, Gasifier, Scrubbers, Precipitators.

In an effort to convert coal into substitute-natural gas (SNG) in an environmentally acceptable manner, the gasification plant will require extensive controls to prevent the release of large quantities of pollutants to the environment. Data collected in a small gasifier is used to project environmental impact of a full-scale plant employing the synthane process (one of four new coal-to-SNG processes), and to estimate the cost of controls. Various emissions including sulfur, nitrogen oxides, assorted gases, and solid effluents like ash and lime sludge are discussed and related to possible control options. These include desulfurization before combustion, redesigning processes to reduce emissions, means to reduce particulate matter and harmful gaseous material and the use of precipitators and scrubbers. Ponding for solid and liquid disposal, recycling of uncontaminated water, and treatment of polluted water downstream from gasifier are other alternatives for treatment of effluents generated in SYNTHANE process. Estimates of cost of pollution controls are listed. This study indicates that gaseous, solid and liquid wastes from a full-scale SYNTHANE plant can be controlled in an acceptable manner at an acceptable cost. (See also W75-07089) (Salzman-North Carolina)
W75-07098

TREATMENT OF A MUNITIONS-MANUFACTURING WASTE BY THE FIXED ACTIVATED SLUDGE PROCESS,
Virginia State Water Control Board, Richmond.
R. C. Albert, R. C. Hoehn, and C. W. Randall.
Typescript paper prepared for the 27th Annual Purdue Industrial Waste Conference, Purdue University, Lafayette, Indiana, May 2-4, 1972. 36 p, 12 fig, 5 tab, 13 ref.

Descriptors: *Activated sludge, *Waste treatment, *Treatment facilities, *Bacteria, *Biochemical oxygen demand, *Chemical oxygen demand, Effluents, Organic compounds, Aerobic bacteria, Aerobic treatment, Biological treatment, Flocculation, Microbial degredation, Sludge digestion, Sludge treatment.
Identifiers: *Munitions manufacturing wastes, Filamentous bacteria, Fixed activated sludge.

The mode of treatment differed from conventional activated sludge processes in that attached, filamentous microorganisms, rather than suspended, flocculent biomasses, were the active biota. The waste, the treatment process, and the treatment unit are described in detail. The utilization of organic substrate in the fixed activated sludge (FAS) treatment unit, expressed as a percentage of the influent concentration, was assessed in terms of three parameters: total organic carbon, biochemical oxygen demand, and chemical oxygen demand. Substrate utilization then was expressed as a function of three variables: the influent organic strength, the dilution of the raw waste, and the screen area in contact with the waste during its passage through the treatment unit. The treatment of the munitions-manufacturing waste by the FAS process is not only feasible, but the efficiency and kinetic parameters compared favorably to values reported in the literature for treatment of other wastes by conventional activated sludge. (Poertner)
W75-07106

THE TREATABILITY OF A MUNITIONS-MANUFACTURING WASTE WITH ACTIVATED CARBON,
Rummel, Klepper and Kahl, Baltimore, Md.
G. R. Schulte, R. C. Hoehn, and C. W. Randall.
Paper presented at the 28th Annual Purdue Industrial Waste Conference, Purdue University, West Lafayette, Indiana, May 2-4, 1973. 35 p, 5 tab, 9 fig, 13 ref.

Descriptors: *Activated carbon, *Nitrates, *Sulfates, *Organic wastes, *Lime, *Waste water treatment, Water pollution treatment, Adsorption, Trickling filters, Nitrogen compounds, Organic compounds, Color reactions.
Identifiers: *Munitions manufacturing wastes, Trinotrotoluene(TNT), Color removal, Nitroaromatic compounds.

The extent was studied to which color and nitroaromatic compounds (including TNT and its isomers) could be removed from a munitions-manufacturing waste with one type of activated carbon. The effect of pH on the adsorption characteristics also was evaluated. Adsorptive properties of the activated carbon for the particular waste in question, and for pure a-TNT, were determined by Freundlich isotherm analysis and by breakthrough curves. The waste used in this study was high in solids, nitrates, and sulfates; was extremely acidic; and contained many nitroaromatic compounds in addition to trinitrotoluene (TNT). The color of the waste was yellow to orange, and the intensity was pH dependent. Both batch studies and column studies were conducted to determine the adsorbability of color and aromatic nitrobodies by activated carbon. Treatment with activated carbon for the removal of nitroaromatic compounds

and color in wastes originating from the manufacture of TNT is technically feasible. Nitroaromatic compounds, including TNT, that react to produce color with the Silas-Mason test, are best adsorbed by carbon when the waste is strongly acidic. Color removal also is best accomplished from an acidic medium. The TNT-manufacturing wastes should not be neutralized with lime prior to treatment with carbon. (Poertner)
W75-07107

FACTORS THAT AFFECT ACTIVATED SLUDGE PHOSPHATE RELEASE,
Virginia Polytechnic Inst., Blacksburg.
C. W. Randall, B. S. Hulcher, and P. H. King.
Journal of the American Water Resources Association, Water Resources Bulletin, Volume 6, No 4, p 648-660, August, 1970, 11 fig, 1 tab, 13 ref.

Descriptors: *Sanitary engineering, *Activated sludge, *Phosphates, *Biological treatment, *Chemical reactions, *Nutrient removal, Oxidation-reduction potential, Dissolved oxygen, Aerobic treatment, Sludge, Microbial degradation, Sludge treatment, Biodegradation, Oxygen demand, Laboratory tests.

The activated sludge process can remove significant amounts of phosphorus from sewage, but the removal efficiency is usually significantly reduced by the release of phosphate back to solution during subsequent treatment steps. Soluble phosphate release from activated sludge was studied with emphasis on defining the factors that affect such release and the actual release mechanisms. Laboratory units were used for experimental purposes. The experiments were designed to study the relationship between soluble phosphate release and various environmental factors such as redox potential (ORP), dissolved oxygen (DO), pH, solids concentration, solids destruction, and sulfate salt addition. The effect of substrate utilization on phosphate uptake and the relationship between uptake characteristics and subsequent phosphate release were also studied. The results show that some phosphate storage occurs during aerobic substrate utilization. Following substrate utilization, activated sludge phosphate release is dierectly related to the amount of biological stress the organisms are subjected to, and the mechanism of release is primarily cell lysis. The phosphate released per unit sludge under anoxic conditions is relatively constant. Under normal environmental conditions, neither ORP or pH change have a significant affect on phosphate release. (Poertner)
W75-07108

WASTE WATER TREATMENT WORKS DATA BOOK.
Illinois State Environmental Protection Agency, Springfield.
January 1972. 118 p, 4 tab.

Descriptors: *Waste water treatment, *Data storage and retrieval, *Sewage treatment, *Treatment facilities, *Drainage districts, *Illinois, Data collections, Treatment, Public utilities, Utilities, Water pollution control, Information retrieval, Governments, Data processing.
Identifiers: Waste water treatment works, Sewage treatment plants.

Data are tabulated on waste water treatment works discharging to Illinois waters and on treatment works under construction permit from the Environmental Protection Agency or its predecessor, the Sanitary Water Board. Since the design data and plans for any given plant must be coded for computer storage, the processes and equipment stated for a given plant may only represent approximations to actual processes or equipment in use, or may be generic names used where a more appropriate code is not available. The data are for informational purposes only, and do not necessarily describe fully the processes and equipment considered prior to issuance of a construction permit or operating permit to the owner of the treatment works. Information is presented on: population data; treatment works, listed by ownership types; new treatment works under construction or operating permit, by ownership type; and treatment works, organized by process employed. Data are also given on specific facilities including the name of the owner, drainage basin, type of treatment, and the treatment facilities. (Poertner)
W75-07109

BIOLOGICAL TREATMENT OF HIGH THIOSULFATE INDUSTRIAL WASTE WATER,
Virginia Polytechnic Inst., Blacksburg.
W. C. Kreye, P. H. King, and C. W. Randall.
Paper presented at the 28th Annual Industrial Waste Conference, Purdue University, Lafayette, Indiana, May 1973. 26 p, 4 tab, 8 fig, 7 ref.

Descriptors: *Sulfates, *Biological treatment, *Reduction(Chemical), *Industrial wastes, *Organic wastes, *Activated sludge, Chemical oxygen demand, Oxidation, Nitrogen, Phosphorus, Waste treatment, Biochemical oxygen demand.
Identifiers: Thiosulfate removal.

A biological system was studied capable of achieving a high degree of thiosulfate removal from a typical industrial wastewater. In addition removal of organic matter was another goal of the total treatment process. Although the concentration of organics in the wastewater selected was low, organic removal in the presence of a high concentration of thiosulfate was monitored since it seemed desirable to develop a biological system that would be capable of treating a mixed industrial thiosulfate waste and domestic sewage in one unit. Since thiosulfate has a very high biochemical oxygen demand (BOD), thiosulfate must be oxidized or reduced by either a chemical or a biological process to remove the B.O.D. from the wastewater. An activated sludge unit can be acclimated to successfully oxidize high concentrations of thiosulfate. In the process the system may lose its ability to oxidize organic material. Thiosulfate oxidation is best accomplished at a low mixed liquor pH. Rising pH levels are an early indication of an impending failure of the system. The nitrogen and phosphorus requirement of biological thiosulfate oxidation systems is very low. (Poertner)
W75-07110

COLUMNAR DENITRIFICATION OF A MUNITIONS MANUFACTURING WASTEWATER,
Environmental Protection Agency, Manassas, Va. Advanced Waste Treatment Research Lab.
D. O. Tucker, C. W. Randall, and P. H. King.
Paper presented at the 29th Annual Purdue Industrial Waste Treatment Conference, Purdue University, Lafayette, Indiana, May 7-9, 1974. 18 p, 2 fig, 3 tab, 19 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Nitrates, *Organic compounds, *Activated carbon, *Denitrification, Organic wastes, Trickling filters, Tertiary treatment, Solids contact processes, Nutrient removal, Adsorption.
Identifiers: *Munitions manufacturing wastes, Columnar denitrification.

The possibility was studied of treating two industrial wastes from a denitrification unit. One waste is high in nitrates and low in organic matter; the other high in organic matter and low in nitrates. The experiments were also designed to provide information concerning rapid denitrification in a columnar unit. The wastes were mixed to the desired proportions and subjected to columnar denitrification. Two bench-scale denitrification columns were constructed and used to investigate the feasibility of columnar denitrification of the industrial nitrate waste, to determine the amount of organic carbon waste needed for denitrification, and to define the detention time necessary for efficient operation of the columns. Throughout the entire period of operation of the activated carbon column, very good denitrification results were achieved. Never in the course of the experiment did the total nitrogen removal fall below 98.3%. Removal efficiencies as high as 99.3% were observed with an average removal of 98.9%. These figures demonstrate the stability of operation and high removal efficiencies possible at an average packed column detention time of 157.5 minutes. The organic carbon removal efficiency fluctuated more than did the total nitrogen removal efficiencies. The highest removal efficiency noted was 74.6% while the lowest was 42.6% with an average of 61.2%. (Poertner)
W75-07111

COMPARATIVE EFFECTIVENESS OF SELECTED PRECIPITANTS FOR PHOSPHORUS REMOVAL IN TERTIARY TREATMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
P. H. King, J. D. Jenkins, R. C. Hoehn, and C. W. Randall.
Paper presented at the Fourth Annual Environmental Engineering and Science Conference, University of Louisville, Louisville, Kentucky, March 4-5, 1974. 15 p, 3 tab, 11 fig, 12 ref.

Descriptors: *Nutrient removal, *Phosphorus, *Tertiary treatment, *Chemical precipitation, *Waste water treatment, *Sewage treatment, Trickling filters, Effluents, Lime, Flocculation, Coagulation, Dewatering, Sludge, Suspended solids, Comparative benefits.
Identifiers: *Precipitants.

The performance was determined of add-on tertiary treatment units designed for substantial phosphorus removal from the effluent of a conventional trickling filter sewage treatment plant. Precipitants selected for study were lime, alum, sodium aluminate, and ferric sulfate. In each case dosage of the coagulant was sufficient to achieve a residual total phosphorus concentration of less than 0.3 mg/l. In addition to chemical dosage in terms of required cation to phosphorus molar ratio, optimum pH level and flocculation time were determined, concurrent suspended solids and total organic carbon removal efficiencies were defined, and the general dewatering properties of the remaining sludge were qualitatively described. The required dosages show that substantially higher dosages of lime are required than for either alum, sodium aluminate or ferric sulfate. Phosphorus removal using lime is strongly pH dependent. One of the most important aspects of selecting an appropriate precipitant for phosphorus removal in tertiary treatment is the quantity and quality of the sludge produced. Lime treatment yielded the largest volume of sludge, but the dewatering properties were excellent. In each of the systems tested, the concurrent suspended solids removal was excellent, providing a significant benefit for the type of add-on tertiary treatment being investigated. (Poertner)
W75-07113

CONSIDERATIONS FOR ANALYSIS OF INFILTRATION-INFLOW,
Edison Water Quality Research Lab., N.J.
R. Field, and D. J. Cesareo.
A paper presented at the 1974 International Public Works Congress and Equipment Show, Toronto, Ontario, Canada, September 16, 1974. 27 p, 1 fig, 2 tab, 11 ref.

Descriptors: *Infiltration, *Inflow, *Sewerage, *Rainfall-runoff relationships, *Sewers, Groundwater movement, Infiltration rates, Runoff, Simulated rainfall, Combined sewers, Data collections, Cost-benefit analysis, On-site data collections, Annual costs, Maintenance costs, Operating costs.
Identifiers: *Sanitary sewers, Extraneous flows, Surcharge.

The U.S. Environmental Protection Agency (EPA) has developed basic guidelines to follow in developing a thorough cost-effective infiltration/inflow evaluation and correction program. Infiltration/Inflow is defined as the total quantity of water from both infiltration and inflow without distinguishing the source. Excessive Infiltration/Inflow is defined as the quantities of infiltration/inflow which can be economically eliminated from a sewer system by rehabilitation. Infiltration and inflow countermeasures can be divided into two parts: prevention of excessive extraneous flows, and correction of conditions already imposed on existing sewer systems. The EPA proposes an initial survey to determine if the infiltration/inflow is excessive and if it is, then a sewer system evaluation survey should be made. This survey is the systematic examination of the sewer system to determine the specific location, flow rate and rehabilitation costs of each infiltration/inflow source or sources. The evaluation survey is outlined as a series of five consecutive parts consisting of the physical survey, the rainfall simulation, preparatory cleaning, internal inspection, and the survey report. Cost analyses are given for both the infiltration/inflow analysis and the sewer system evaluation. Case studies are described. (Poertner)
W75-07117

WASTE WATER RECLAMATION: THE STATE-WIDE PICTURE,
California State Dept. of Water Resources, Sacramento.
J. R. Teerink.
Typescript paper presented at a meeting of the Water Section of the Commonwealth Club, San Francisco, California, May 2, 1974. 13 p.

Descriptors: *Water reuse, *Return flow, *Groundwater recharge, *Water utilization, *Reclaimed water, *Water supply, Water allocation(Policy), Water conservation, Water demand, Water quality control, California, Artificial recharge, Water yield improvement, Irrigation water, Waste water treatment.
Identifiers: Waste water reclamation, Agricultural waste water.

Waste water reclamation appears to be the most promising method of developing a supplemental source of water. Reclaimed water can be used after ground water recharge for almost any purpose. It can be used directly for agricultural and other irrigation, recreation, and industrial purposes, including use as cooling water. Waste water reclamation is defined as 'the planned renovation of waste water with the intent of producing usable water for a specific beneficial purpose.' Much of the water used in California is returned to the freshwater cycle, either directly after its use or following treatment. This includes 95 percent of the irrigation return waters from nearly 9 million acres of irrigated land and the treated wastes from inland cities, particularly in the Central Valley. Although reclamation (demineralization) of these waters would tend to enhance water quality, it would not create a new supply. Waste water reclamation possibilities in the San Francisco Bay area have recently been studied by the Department of Water Resources and the State Water Resources Control Board. The study has shown that a large amount of waste water, perhaps 500,000 acre-feet, can be reclaimed by the year 1980. This source of water could present an attractive opportunity for meeting future demands for power plant cooling, an option that becomes increasingly important. The use of reclaimed agricultural waste water in the power plant cooling process would not only satisfy water supply needs but assist in solving waste disposal needs as well. (Poertner)
W75-07118

REGIONAL SEWAGE TREATMENT NEEDS FOR EUGENE-SPRINGFIELD URBAN AREA.
CH2M/Hill, Corvallis, Oreg.
Eugene, Oregon, February, 1975. 160 p, 21 fig, 25 tab, 19 ref, 4 append.

Descriptors: *Waste water treatment, *Planning, *Sewerage, *Oregon, *Regional development, Waste water disposal, Sewers, Sewage districts, Sewage treatment, Sanitary engineering, Cities, Flood protection, Alternate planning.
Identifiers: *Eugene(Oregon), *Springfield(Oregon).

Two governmental bodies provide sewerage services: Eugene and Springfield, Oregon through the Springfield Utility Board. Recently passed local legislation places all responsibility for Springfield sewage collection and treatment on the City of Springfield forces. Based on evaluation of costs and related factors, regional sewage treatment for the metropolitan Eugene-Springfield urban area will be accomplished by separate expansion and upgrading of the existing Eugene and Springfield facilities. Two regional sewage treatment plans have been analyzed. Plan A, the 'Dual Regional Plant Plan,' assumes separate and parallel expansion and upgrading of the existing Eugene and Springfield facilities. Plan B, the 'Single Regional Plant Plan,' considered abandonment of existing Springfield facilities; expansion and upgrading of the Eugene facilities; and construction of a 72-inch diameter connecting interceptor sewer. An evaluation and ranking process was used to analyze each plan. This included monetary cost effectiveness, implementation capability, financial equity and cost allocation, compatability with local planning, utilization of existing facilities, energy consumption, comparative environmental compatability, and comparative reliability and flexibility. It is recommended that both the City of Eugene and the City of Springfield undertake work remaining to: complete federal facilities planning requirements, review and update user ordinances, authorize detailed predesign work, and explore methods of financing. (Poertner)
W75-07119

WASTE WATER MANAGEMENT - IMPLICATIONS FOR REGIONAL PLANNING,
For primary bibliographic entry see Field 8A.
W75-07120

WASTE WATER MANAGEMENT - ALTERNATIVES FOR THE MERRIMACK RIVER,
Corps of Engineers, New York. North Atlantic Div.
F. M. McGowan.
In: The Merrimack: Design for a Clean River, American Society of Civil Engineers, National Meeting, Session No. 17, Washington, D.C., January 30, 1973. 7 p, 20 fig.

Descriptors: *Waste water treatment, *Tertiary treatment, *Water pollution control, *Alternate planning, *Regional analysis, Multiple-purpose projects, Optimization, Water quality control, Costs, Management, Planning, Annual costs, Capital costs, Administration, Waste water management, New Hampshire, Massachusetts.
Identifiers: *Merrimack River Basin.

The regional solutions suggested for the Merrimack River pollution abatement program are based on: high water quality, reuse of treated wastewaters, advanced technologies, alternative systems, and coordinated basin and metropolitan area wastewater management. In examining regional solutions, inspection shows pollution to be coming primarily from: (1) recreational areas at the headwaters of the Merrimack: the Laconia-Franklin area; (2) New Hampshire State capital area - the City of Concord; (3) heavily industrialized cities of Manchester, New Hampshire; (4) Nashua, New Hampshire; (5) Fitchberg-Leominster area in Massachusetts; and (6) the Lowell-Lawrence and Haverhill area in Massachusetts. Solutions for the Merrimack could be developed depending on the objectives of the people and their representatives. The land and water technologies could be mixed, for example, so that the secondary-tertiary treatment system would function in the non-irrigation season and the secondary portion combined with land could take over then, in the remainder of the year. During the irrigation season, the tertiary system, with its high operating costs, could be shut down and the land scheme used. The approach also combines many of the benefits and opportunities discussed for the two individual technologies. A cost estimate for such an approach would be about $1 billion in capital expenditures and $100 million in annual operating costs. (Poertner)
W75-07122

TECHNIQUES OF WASTE WATER MANAGEMENT,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
W. W. Eckenfelder, Jr.
In: The Merrimack: Design for a Clean River, American Society of Civil Engineers, National Meeting, Session No. 17, Washington, D.C., January 30, 1973. 19 p, 2 fig, 2 tab, 22 ref.

Descriptors: *Tertiary treatment, *Waste water treatment, *Water pollution control, *Optimization, *Regional analysis, Industrial wastes, *Municipal wastes, Water quality control, Treatment facilities, Sewage treatment, Administration, Management, New Hampshire, Massachusetts.
Identifiers: *Merrimack River Basin, Waste water management.

In tertiary treatment of wastewater, it is essential to optimize the biological process in order to effect optimal performance and economics from the tertiary system. It is possible to estimate the average effluent quality from a secondary treatment facility as design input for tertiary treatment design; however, variation in secondary effluent quality can exert a profound effect on tertiary performance. In recent years, a number of biological process modifications have been developed to enhance the treatment efficiency and to provide a more uniform effluent, such as: (1) high purity oxygen in which dissolved oxygen levels of 10 mg/l are maintained in the aeration basin; and, (2) powdered activated carbon added to aeration basins. There are a number of process combinations including biological, physical and chemical which are technically feasible to produce an effluent of any desired quality. The selection of the optimum process combination to yield the least cost will depend upon the volume and characteristics of the wastewaters being treated and upon the availability and cost of chemicals and equipment. As regional and combined treatment systems increase in use several considerations are necessary to insure optimal and consistent effluent quality. If physical-chemical treatment is to be considered, pretreatment of many of the industrial wastewaters that are poorly adsorbed on carbon and could lead to high biological growths on the carbon and bed clogging. Equalization of the industrial wastewaters and to some degree the municipal wastewaters is important to insure uniform effluent quality. Where the activated sludge process is to be employed, optimization of the process to minimize effluent COD, N and P is essential for optimal and economic operation. (Poertner)
W75-07123

HEALTH ASPECTS OF WATER REUSE,
Los Angeles County Sanitation District, Calif.
For primary bibliographic entry see Field 3C.
W75-07129

A SMALL SCALE SWIRL CONCENTRATOR FOR STORM FLOW,
Wisconsin Univ., Milwaukee.
R. A. White.
MS thesis, May 1974. 55 p, 25 fig, 10 tab, 15 ref, 2 append.

Descriptors: *Sewerage, *Water pollution control, *Flood control, *Model studies, *Storm runoff, *Combined sewers, Sewage, Sewage treatment, Sewers, Conveyance structures, Storm surge, Wisconsin, Storm drains, Storm water, Overflow.
Identifiers: *Swirl concentrator, Sewer backups.

An investigation was made of operational characteristics of the swirl concentrator, a new device which was developed for the regulation of suspended matter in combined sewer flows. This device has been shown to be very effective in removing solids quickly. It has no moving parts, and can be made of concrete and put underground. This should allow for some treatment of the sewage before discharge into the storm water during heavy seasonal rains. The swirl concentrator would need no attention during storm flow operation. Further, the apparatus is small and inexpensive to justify its temporary use in developed residential areas. Historically the swirl concentrator has been fed by gravity sewers. In this study, it was necessary to adapt pumped sewage discharge to the concentrator. It was shown by scaled model study that a swirl concentrator could be devised on a small scale for use with small pumps in relieving surcharged sewers. The modification made for this special application was found to be applicable to, and improving upon normal scale swirl concentrators. (Poertner)
W75-07130

REGIONAL WATER QUALITY MANAGEMENT PLAN, 1973,
Bay Area Sewage Services Agency, Berkeley, Calif.
For primary bibliographic entry see Field 5G.
W75-07132

LAND APPLICATION ALTERNATIVES FOR WASTEWATER MANAGEMENT.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W75-07135

A PROGRAM FOR WATER RECLAMATION AND GROUNDWATER RECHARGE, ENVIRONMENTAL IMPACT STATEMENT.
Jenks and Adamson, Palo Alto, Calif.
For primary bibliographic entry see Field 4B.
W75-07137

RECLAMATION OF WASTEWATER IN SANTA CLARA COUNTY: A LOOK AT THE POTENTIAL.
Consoer, Townsend and Associates, San Jose, Calif; and Bechtel Corp., San Francisco, Calif.
Santa Clara Valley Water District, San Jose, California, October 1973. 18 p, 11 fig, 3 tab.

Descriptors: *Water reuse, *Water utilization, *Artificial recharge, *Recharge, *Reclaimed water, Water allocation(Policy), Water conservation, Water demand, Water quality control, California.
Identifiers: Santa Clara County(California).

In 1970, in response to the growing concern about water sources and water management a long range plan for wastewater disposition was begun. One facet was a study to determine the potential benefits or disadvantages of reclaiming and reusing wastewater rather than discharging it into San Francisco Bay. There will be a critical need for augmented water supplies both in Santa Clara County and throughout the large San Felipe Service Area starting in 1978. In looking at the markets for reclaimed wastewater in the area to be served by the proposed San Felipe Project, it was found that by far the major market or use for reclaimed wastewater would be groundwater recharge in north Santa Clara County. Another large market for reclaimed water would be farms and orchards in the area. Present wastewater quality was compared to present and projected water supplies. Alternative programs using reclaimed wastewater were studied. Four of these plans use reclaimed water rather than importation, and the fifth alternative combines reclamation and importation. A system combining importing water and reclamation would be cheaper than reclamation and reuse alone. (Poertner)
W75-07138

MATHEMATICAL MODELS OF MAJOR DIVERSION STRUCTURES IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWER SYSTEM,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
G. S. Harris.
Memorandum No. 120, December 1968. 21 p, 28 fig, 2 tab, 5 ref, 1 append.

Descriptors: *Combined sewers, *Water pollution control, *Mathematical models, *Diversion structures, *Computer models, *Interceptor sewers, Sewers, Hydraulic structures, Minnesota, Computer models, Mississippi River, Sanitary engineering.
Identifiers: Minneapolis(Minnesota), St. Paul(Minnesota).

The hydraulic characteristics are described of 19 different diversion structures, which comprise 6 types in the Minneapolis St. Paul interceptor sewer system. No two diversion structures are the same, but some are quite similar in their geometry. From the general hydraulic description of the diversion structures, it is possible to arrive at equations which describe the flow diverted to the interceptor sewer in terms of the flow entering the diversion and the settings of the gates and Fabridams. A computer program has been written to calculate the flow diverted to the interceptor at each of the 19 main diversion structures which fall into the six types. The program has as input for a particular diversion structure the fixed constants such as orifice width, diameter of gate, discharge coefficients, the gate and Fabridam heights, and the inflow to the diversion structure. Each diversion structure type has a subroutine which accepts the appropriate information and solves the flow diverted to the interceptor. From the mathematical description of the diversion structures and the computer program it has been possible to derive a set of operating graphs for the diversion structures. For a given inflow the flow which is diverted to the interceptor depends on the Fabridam and gate settings. (Poertner)
W75-07142

DEVELOPMENT OF A COMPUTER PROGRAM TO ROUTE RUNOFF IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWERS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
G. S. Harris.
Memorandum No. 121, December 1968. 18 p, 29 fig, 1 tab, 13 ref, 1 append.

Descriptors: *Routing, *Water quality control, *Computer programs, *Rainfall-runoff relationships, *Interceptor sewers, Sewers, Data storage and retrieval, Programs, Minnesota, Runoff, Mississippi River, Combined sewers, Hydraulics.
Identifiers: Minneapolis(Minnesota), St. Paul(Minnesota), Method of characteristics.

The development is described of a program to route storm runoff through the Minneapolis-St. Paul combined interceptor sewer system. Because of the complicated nature of the pipe layout, a computer program was required to simulate the flow. The program considers the flow which enters the system at 15 major points, which handle 80 per cent of the flow. As there was concern over the applicability of normal flood routing methods in this system, it was decided to solve the equations governing unsteady flow in open channels and compare the results of this solution with conventional routing methods. The method of characteristics is used to determine the flow velocity and depth at increasing intervals of time starting from known or assumed initial conditions in an open channel in which there is insteady flow. The most important result of this phase of the investigation was the conclusion that the average-lag method of routing produces the same results as the method of characteristics if the appropriate routing constants are chosen. As a consequence of this result the whole of flood hydrographs entering the Twin Cities interceptor sewer system can be quickly evaluated to a sufficient degree of accuracy in real time by the progressive average-lag method. (Poertner)
W75-07143

A SIMPLE SYSTEM FOR FREEZE DRYING,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 7B.
W75-07245

THE CHARACTERISTICS AND ULTIMATE DISPOSAL OF WASTE SEPTIC TANK SLUDGE,
Alaska Univ., College. Inst. of Water Resources.
T. Tilsworth.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-241 488, $3.75 in paper copy, $2.25 in microfiche. Completion Report No. IWR-56, November 1974. 30 p, 2 fig, 7 tab, 41 ref, append. OWRT A-039-ALAS (1), 14-31-0001-3802, 14-31-0001-4002.

Descriptors: *Septic tanks, Sludge, Anaerobic conditions, *Alaska, Cold climate, Aerobic conditions, Economics, Aerobic digestion, *Waste water treatment, Waste disposal, *Ultimate disposal, Waste identification, Biochemical oxygen demand, Chemical oxygen demand, Domestic wastes, Sewage treatment, Treatment facilities, Cost analysis.
Identifiers: Fairbanks(Alas).

Individual household treatment of domestic sewage has been accomplished, in part, by the use of septic tanks. These treatment units are still being widely used in urban and rural areas where sewers and sewage treatment facilities are nonexistant. Periodic removal of waste septic tank sludge can result in environmental damage unless adequate provision has been made for processing this sludge for ultimate disposal. Septage samples were obtained from the Fairbanks, Alaska locale and were characterized as to BOD, COD, solids and others. Several experiments were performed on the septic sludge including aeration and digestion studies. Methods of treatment and ultimate disposal were discussed as well as cost analyses.
W75-07273

EFFECTS OF HYDROLIGIC REGIME ON NUTRIENT REMOVAL FROM WASTEWATER USING GRASS FILTRATION FOR FINAL TREATMENT,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
E. A. Myers, and R. M. Butler.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-241 487, $475 in paper copy, $2.25 in microfiche. Pennsylvania Institute for Research on Land and Water Resources University Park, Research Publication 88, December 1974. 65 p, 13 fig, 33 tab, 21 ref, append. OWRT B-054-PA (3). 14-31-0001-3931.

Descriptors: *Overland flow, *Rates of application, *Waste water treatment, *Filters, *Sewage treatment, Seasonal, Effluents, Nitrates, Phosphates, *Nutrient removal, Design criteria, Laboratory tests, On-site tests.

Identifiers: *Nitrate removal, *Phosphate removal, *Grass filtration system, Application frequency, Long contact time.

Grass filtration has been proposed as a method for final treatment of secondary treated sewage effluent. The effectiveness of grass filtration or overland flow wastewater systems, however, has not been tested adequately. Thus, a field study was conducted to determine the effects of wastewater application rate, flow distance, application frequency, and season of the year on nitrate and phosphate removal. The removal of phosphate and nitrate, however, increased as the application frequency was decreased. However, in all the field tests, the reduction in phosphate and nitrate was very small, zero to approximately 20 percent. Laboratory tests, undertaken because of the small nitrogen removals in the field, were conducted. Five to six hours were required in the laboratory to achieve a 90 percent reduction in nitrate concentration from an effluent with an initial NO3-N concentration of 12 mg/l. The field and laboratory studies indicate that obtaining a sufficiently long contact time is the most important consideration in designing a grass filtration system. (Sink-Penn State)
W75-07276

ECONOMIC IMPACT STUDY OF THE POLLUTION ABATEMENT EQUIPMENT INDUSTRY.
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W75-07345

COST-EFFECTIVE DESIGN OF WASTEWATER TREATMENT FACILITIES BASED ON FIELD DERIVED PARAMETERS.
Saint Louis Metropolitan Sewer District, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 356, $5.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report No. EPA-670/2/-74-062, July 1974. 100 p, 20 fig, 13 tab, 12 ref, 3 append. 1BB043. 11060 GVT.

Descriptors: *Sewage treatment, *Economic efficiency, Facilities, *Design, *Waste water treatment, Pilot plants, Cost-benefit ratio, Peak loads, Mathematical models, Annual costs, *Missouri, *Treatment facilities, Cost analysis.
Identifiers: Metropolitan St. Louis Sewer Dist., *St. Louis(Mo).

The Metropolitan St. Louis Sewer District is currently expanding its two major primary treatment facilities for secondary treatment equivalence. These plants process about 100 mgd and characterize the extremes encountered in municipal wastewater treatment. Bissell Point receives a strong wastewater dominated by industrial discharges; Lemay receives highly diluted wastewater. Both plants are less than five years old. A variety of special plant, pilot plant, and laboratory investigations were conducted to develop cost-effective mathematical models to describe optimum design conditions (and costs) for secondary treatment and waste solids handling as a function of the required design reliability, establish the optimum point of design reliability as a function of facility expenditure for each plant, and compare the cost differential between the two plants to illustrate the influence of wastewater quality upon facility costs and optimum design configurations. The optimum point of design reliability for both plants was 97.6%. Increasing reliabilities resulted in a gradual decline of the benefit/cost ratio to about 90% of optimum at 99.91% reliability. It is recommended that all systems be designed for rationally defined boundary conditions and peaking factors. Computer programs were developed to solve the optimum design configuration as a function of design reliability. (Auen-Wisconsin)
W75-07349

5E. Ultimate Disposal Of Wastes

DEWATERING OF EXCESS ACTIVATED SLUDGE AT THE SYASYA INTEGRATED PULP AND PAPER MILL (OBEZVOZHIVANIE IZBYTOCHNOGO ILA NA SYAS'KOM KOMBINATE),
Syasskii Lesokhimicheskii Kombinat (USSR).
For primary bibliographic entry see Field 5D.
W75-06875

LAND APPLICATION ALTERNATIVES FOR WASTEWATER MANAGEMENT.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W75-07135

PRELIMINARY REVIEW OF USED LUBRICATING OILS IN CANADA,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W75-07151

GROUND-WATER QUALITY BENEATH SOLID-WASTE DISPOSAL SITES AT ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5B.
W75-07204

INVESTIGATING GROUND-WATER POLLUTION FROM INDIANAPOLIS' LANDFILLS--THE LESSONS LEARNED,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 5B.
W75-07205

GROUND-WATER CONTAMINATION IN THE SILURIAN DOLOMITE OF DOOR COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 5B.
W75-07207

THE CHARACTERISTICS AND ULTIMATE DISPOSAL OF WASTE SEPTIC TANK SLUDGE,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W75-07273

5F. Water Treatment and Quality Alteration

PAPER AND PAPERBOARD MANUFACTURING. (2). WATER SUPPLIES,
Paper, Vol 183, No 2, p 81-82, 85, 87, January 20, 1975. 4 fig.

Descriptors: *Industrial water, *Pulp and paper industry, *Water supply, *Water treatment, *Water utilization, *Water softening, *Water pollution, Rain water, Surface waters, Groundwater, Boiler feed water, Solvents, Bicarbonates, Sulfates, Nitrates, Chlorides, Calcium, Magnesium, Suspended solids, Color, Flocculation, Coagulation, Chemical precipation, Ion exchange, Lime, Separation techniques, Iron compounds, Salts.

This general discussion of water covers water supplies (rain, surface, and ground waters); uses of water in paper and board manufacture (including boiler makeup water, condensing water, pulp washing, dilution and transport of papermaking stock, solution of chemicals, washing media for wires, felts, etc.); chemical impurities in water (calcium and magnesium bicarbonates, sulfates, chlorides, and nitrates, and iron salts); removal of suspended matter and color from water by flocculation, coagulation, sedimentation, and filtration; and water softening by the lime-soda and ion-exchange processes. (Sykes-IPC)
W75-06889

HIGH-RATE WATER TREATMENT: A REPORT ON THE STATE OF THE ART,
American Society of Civil Engineers, New York. Subcommittee on High-Rate Water Treatment.
P. H. King, R. L. Johnson, C. W. Randall, and G. W. Rehberger.
Typescript, July, 1974. 20 p, 9 tab, 4 fig, 5 ref.

Descriptors: *Municipal water, *Water treatment, *Water purification, *Filtration, *Flocculation, *Water quality control, *Sedimentation, Settling basins, Coagulation, Water softening, Lime, Treatment, Data collections.
Identifiers: High-rate water treatment, Hydraulic loading, High-rate filtration.

The ASCE-EED Committee on Water Purification recently conducted a survey of State regulatory agencies to determine the prevailing concept of 'high-rate' water treatment and to ascertain their attitude toward the various methods currently being employed. A second phase of the Committee's work was concerned with an analysis of operating data from several high-rate water treatment plants in Virginia. In considering the results of this study, the Committee concluded that while the general understanding of the term 'high-rate treatment' usually pertains to higher hydraulic loading rates on filtration units, a broader based concept of high-rate treatment that includes other units as well needs to be propogated. The entire system, from rapid mix to final stabilization and disinfection, should be handled as a single entity to arrive at the optimum and most economical solution for each case. The data cited in this paper clearly indicate that the propriety of utilizing high-rate treatment processes in many municipal water treatment facilities has been adequately demonstrated. Finally, the Committee concluded that there are economic advantages inherent in high-rate treatment and these are gained without sacrificing water quality. (Poertner)
W75-07112

PREVENTIVE MAINTENANCE,
East Bay Municipal Utility District, Oakland, Calif.
For primary bibliographic entry see Field 8C.
W75-07115

A SIMPLE SYSTEM FOR FREEZE DRYING,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 7B.
W75-07245

5G. Water Quality Control

ORGANIZING FOR TODAY'S EFFLUENT CONTROL NEEDS,
Intercontinental Pulp Co. Ltd., Prince George (British Columbia).
For primary bibliographic entry see Field 5D.
W75-06863

A PRELIMINARY REVIEW OF ANALYTICAL METHODS FOR THE DETERMINATION OF SUSPENDED SOLIDS IN PAPER INDUSTRY EFFLUENTS FOR COMPLIANCE WITH EPA-NPDES PERMIT TERMS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5A.
W75-06865

FDA'S PROGRAM OF MERCURY IN FOODS,
Food and Drug Administration, Seattle, Wash.
F. D. Clark.
In: Mercury in the Western Environment, Continuing Education Publications, Corvallis, Oregon, p 81-84, 1973. 2 ref.

Descriptors: *Mercury, *Foods, *Regulations, *Public health, Toxicity, Analytical techniques, Spectroscopy, Heavy metals, *Standards, Pollutant identification.

The history of the U.S. Food and Drug Administration's (FDA) current interest concerning mercury in foods, with emphasis on fish and shellfish was traced. The toxicological basis for the guideline figure of 0.5 ppm was discussed, as well as the relationship of this figure to available methodology. The results of the surveys on the mercury content of several foods were reported, and available details and results on current surveys of fish and shellfish for mercury were provided as well as a general description of the present FDA program for mercury in foods. (See also W75-06897) (Jernigan-Vanderbilt)
W75-06905

THE HUMAN HEALTH HAZARDS OF METHYLMERCURY,
Mayo Clinic, Rochester, Minn. Dept. of Medical Statistics, Epidemiology and Population Genetics.
For primary bibliographic entry see Field 5C.
W75-06925

THE NEED FOR A COMPREHENSIVE APPROACH IN THE MANAGEMENT OF ENVIRONMENTAL RESOURCES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W75-06938

PROBABILISTIC METHODS IN STREAM QUALITY MANAGEMENT,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-06946

ON THE EFFICIENT ALLOCATION OF ENVIRONMENTAL ASSIMILATIVE CAPACITY: THE CASE OF THERMAL EMISSIONS TO A LARGE BODY OF WATER,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5B.
W75-06950

WATER MANAGEMENT--A GENERAL REPORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W75-06953

A GEOMETRIC PROGRAMMING MODEL FOR OPTIMAL ALLOCATION OF STREAM DISSOLVED OXYGEN,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5D.
W75-06954

SIMULATION AS AN AID TO DECISION MAKING IN A WATER UTILITY,
Puerto Rico Aqueduct and Sewer Authority, Santurce. Planning Area.
For primary bibliographic entry see Field 6A.
W75-06959

VANVOOREN V. JOHN E. FOGARTY MEMORIAL HOSPITAL (ACTION FOR DAMAGES AND RELIEF FROM POLLUTION OF ARTESIAN WELL).
For primary bibliographic entry see Field 6E.
W75-06962

STATE BOARD'S DISCRETIONARY POWER TO PENALIZE POLLUTERS DECLARED INVALID.
For primary bibliographic entry see Field 6E.
W75-06964

SMITH V. JACKSON PARISH SCHOOL BOARD (ACTION FOR DAMAGES TO POND CAUSED BY DEFECTIVE SEWAG SYSTEM).
For primary bibliographic entry see Field 6E.
W75-06965

AMERICAN PAPER INSTITUTE V. TRAIN (ACTION SEEKING REVIEW OF WATER POLLUTION EFFLUENT LIMITATION GUIDELINES FOR THE PAPER INDUSTRY).
For primary bibliographic entry see Field 6E.
W75-06966

ILLINOIS SUPREME COURT OK'S PCB'S POWER TO FINE POLLUTERS.
Pollution Control Guide, Vol 3, paragraph 19820, p 19473-19474, 1974.

Descriptors: *Illinois, *Judicial decisions, *Penalties(Legal), *Law enforcement, *Water pollution control, Jurisdiction, Governments, Water law, Water resources development, Administrative agencies, Water pollution, Adjudication procedure, Regulation, Administration, Legal aspects, Legislation, Decision making.
Identifiers: Environmental policy, State policy.

Specified sections of the Illinois Environmental Protection Act conferring authority on the Illinois Pollution Control Board to impose discretionary, variable, monetary civil penalties on polluters, have recently been held constitutional by the Illinois Supreme Court. The court ruled that the penalty power granted to the Board is not an unconstitutional delegation of judicial power in violation of the separation of powers provisions of the constitutions of either the state of Illinois or the United States. The key factor in considering the question of improper delegation of power is the presence or absence of judicial power. In supporting the Board's power to impose civil penalties the court noted that the U.S. Supreme Court has never found judicial power to have been improperly vested in an administrative agency. The court concluded that the trend in state decisions is to allow administrative agencies to impose discretionary civil penalties. (Sperling-Florida)
W75-06968

BROWN V. RUCKELSHAUS (AND COMPANION CASE) (CHALLENGE TO EXECUTIVE IMPOUNDMENT).
1 Pollution Control Guide, Vol 3, paragraph 15015, p 15147-15156, 1973.

Descriptors: *Judicial decisions, *California, *Allotments, *Federal government, *Administrative agencies, Legal aspects, Legal review, Water law, Political constraints, Federal jurisdiction, Administration, Governmental interrelations, Legislation, project planning, Waste water treatment, Political aspects, Water policy, Financing, Water treatment, Federal Water Pollution Control Act, Adjudication procedure.
Identifiers: Class action suits, *FWPCA Amendments of 1972, Sovereign immunity, Standing(Legal), Administrative regulations, Declaratory judgments, Injunctive relief.

Plaintiff Congressman brought action on behalf of himself and all other citizens of California challenging the defendant Environmental Protection Agency Administrator's impoundment of funds authorized under the Federal Water Pollution Control Act Amendments of 1972. The plaintiff municipality brought suit shortly therafter, and the two actions were consolidated. The plaintiffs contended that the Administrator exceeded his statutory authority in impounding the authorized funds. The defendant argued that the actions were bared by the doctrine of sovereign immunity, that there was no justiciable controversy, that the plaintiffs lacked standing to sue, and that the defendant's actions were within the scope of his discretionary powers under the Act. The United States District Court ruled that both plaintiffs had failed to demonstrate that the defendant's actions had injured or would injure them in any way, and therefore, they lacked standing to sue. The court also ruled that the provision of the Act authorizing citizens to sue on their own behalf did not permit the maintenance of class action suits to challenge the actions of the administrator. Granting the defendant's motion for dismissal, the court went on the state that the impoundment of funds was not beyond the scope of executive discretion. (Deckert-Florida)
W75-06969

CAMPAIGN CLEAN WATER, INC. V. RUCKELSHAUS (CITIZENS SUIT ON IMPOUNDMENT OF FWPCA FUNDS.)
1 Pollution Control Guide, Vol 3, paragraph 15009, p 15108-15116, 1973.

Descriptors: *Judicial decisions, *Virginia, *Allotments, *Federal government, *Waste water treatment, Administrative agencies, Legal aspects, Political constraints, Legal review, Federal jurisdiction, Water law, Governmental interrelations, Administration, Legislation, Project planning, Federal budget, political aspects, Water policy, Financing, Water treatment, Federal Water Pollution Control Act.
Identifiers: Class action suits, *FWPCA Amendments of 1972, Sovereign immunity, Standing(Legal), Administrative regulations, Declaratory judgments, Injunctive relief.

The plaintiff environmental group brought class action seeking declaratory and injunctive relief to compel the defendant federal administrator to allow the full sums authorized by Section 207 of the Federal Water Pollution Control Act Amendments of 1972. The plaintiff challenged the defendant's announced policy with respect to the impoundment of $6 billion of the designated $11 billion authorized by the Act for construction of waste treatment facilities. The defendant sought dismissal of the action on the following grounds: (1) the plaintiff lacked standing to sue; (2) this action was rendered moot by virtue of City of New York v. Ruckelshaus; (3) the doctrine of sovereign immunity; (4) no case or controversy. The United States District Court rejected the defendant's motion and ruled that the challenged policy of impoundment of funds constituted an abuse of discretion and declaring that policy null and void, granted the plaintiffs motion for summary judgment. Recognizing that the Act granted the executive some discretion with respect to appropriations, the court refused to grant injunctive relief and limited the scope of its declaratory judgment to those interests represented by the plaintiff organization. (Deckert-Florida)
W75-06970

THE CITY OF NEW YORK, ET AL. V. RUCKELSHAUS (IMPOUNDMENT OF FEDERAL WATER POLLUTION CONTROL ACT FUNDS).
1 Pollution Control Guide, Vol. 3, paragraph 15008, p 15100-15108, 1974.

Descriptors: *Judicial decisions, *Allotments, *Federal government, *Administrative agencies, *Waste water treatment, Legal aspects, Political constraints, Federal jurisdiction, Legal review,

Water law, Governmental interrelations, Administration, Legislation, Project planning, Political aspects, Water policy, Financing, Water treatment, Federal Water Pollution Control Act.
Identifiers: *Class action suits, *FWPCA Amendments of 1972, Sovereign immunity, Standing(Legal), Administrative regulations, Declaratory judgments, Injunctive relief.

The plaintiff municipality, on behalf of itself and other similarly situated municipalities in the State of New York, brought class action against the defendant Administrator of the Environmental Protection Agency. The plaintiff sought a declaratory judgment and mandamus compelling the defendant to comply with the Federal Water Pollution Control Act Amendments of 1972. Whereas the Act authorized the sums of $5 billion for 1973 and $6 billion in 1974 for the construction of publicly owned sewage treatment works, the defendant had alloted only $2 billion and $3 billion respectively for those periods. The defendant argued that the wording of the Act granted him the discretion to decide how much of the authorization to utilize in granting the plaintiff's motion for summary judgment, the United States District Court for the District of Columbia, while expressly not ruling on the power of the executive concerning the 'obligation' of such sums, ruled that the Administrator must allocate the full amount authorized by Congress. The court rejected the defendant's jurisdiction and standing arguments, and ordered the full amount to be allocated. However, the court stayed the effectiveness of its order pending expedited appeal to the United States, Court of Appeals for the District of Columbia. (Deckert-Florida)
W75-06971

CALVERT CLIFFS COORDINATING COMMITTEE, INC., ET AL. V. UNITED STATES ATOMIC ENERGY COMM'N., ET AL. (ENFORCEMENT OF THE NATIONAL ENVIRONMENTAL POLICY ACT).
For primary bibliographic entry see Field 6G.
W75-06972

TOWARD CLEANER WATER.
Environmental Protection Agency, Washington, D.C.
Available from Superintendent of Documents, U.S. Govt. Printing Office, Washington, D.C. January 1974. 33 p, 7 append.

Descriptors: *Federal Water Pollution Control Act, *Permits, *Pollution abatement, *Water pollution control, Water pollution treatment, Water pollution standards, Water pollution, Effluents, Legislation, Federal government, Jurisdiction, State governments, State jurisdiction.
Identifiers: *FWPCA Amendments of 1972, Effluent limitations, Administrative regulations.

The National Pollutant Discharge Elimination System (NPDES) is a new national permit program designed to control the discharge of pollutants into the Nation's waters. The NPDES, created by the Federal Water Pollution Control Act Amendments of 1972 is an attempt to prevent, reduce, and eliminate water pollution by means of establishing standards of permissible effluent discharge, through the issuance of permits. The NPDES permit, in essence, is a contract between a discharger and the government. A discharger who violates the conditions of the permit or makes illegal discharges without a permit is subject to criminal sanctions of fine or imprisonment. Permanent permit authority may be delegated to a state only if the state meets the requirements of the law and regulations published by the Environmental Protection Agency (EPA). The EPA has authority to veto a proposed state permit if the permit does not comply with the law or EPA regulations. The EPA and the states are required to make public information on the permit system and provide for a public hearing before issuing or denying a permit. (Denvir-Florida)
W75-06973

CORRESPONDENCE CONFERENCE ON REMOVAL OF NITROGEN FROM MUNICIPAL WASTEWATER,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W75-06984

MATHEMATICAL MODELLING OF WATER QUALITY IN A RIVER SYSTEM,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-07031

MATHEMATICAL MODELS FOR THE PLANNING AND MANAGEMENT OF THE SAINT JOHN RIVER SYSTEMS,
Department of the Environment, Ottawa (Ontario). Ecological Systems Research Div.
For primary bibliographic entry see Field 5B.
W75-07032

ENVIRONMENTAL CONSIDERATIONS FOR CONSTRUCTION PROJECTS.
Agency for International Development, Washington, D.C. Office of Science and Technology.
For primary bibliographic entry see Field 6G.
W75-07047

REPORT ON REGIONAL POLLUTION CONTROL: HALIFAX-DARTMOUTH METROPOLITAN AREA.
Halifax-Dartmouth Metropolitan Area Planning Committee (Nova Scotia). Task Group on Water Supply and Waste Disposal.
For primary bibliographic entry see Field 5D.
W75-07085

PLANNING FOR SHORELINE AND WATER USES.
For primary bibliographic entry see Field 6B.
W75-07086

PROCEEDINGS OF THE WORKSHOP ON RESEARCH NEEDS RELATED TO WATER FOR ENERGY.
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 6D.
W75-07089

RESEARCH NEEDS RELATED TO THE ENVIRONMENTAL ASPECTS OF COAL GASIFICATION/LIQUEFACTION,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 6D.
W75-07099

THE LIMNOBIOLOGY OF DEVILS LAKE CHAIN, NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W75-07102

ALAMITOS BARRIER PROJECT,
Los Angeles County Flood Control District, Calif.
For primary bibliographic entry see Field 4B.
W75-07131

REGIONAL WATER QUALITY MANAGEMENT PLAN, 1973,
Bay Area Sewage Services Agency, Berkeley, Calif.
D. F. Murphy.
December 5, 1973. 20 p, 2 tab.

Descriptors: *Planning, *Wastewater pollution, *Drainage water, *Bays, *Water management(Applied), *Water quality control, Water quality standards, Water policy, Water demand, Water allocation(Policy), California, Wastewater disposal, Salt marshes, Administration, Regional development, Impaired water quality, Sewage effluents, Multiple-purpose projects.
Identifiers: *San Francisco Bay.

Formation of the Bay Area Sewage Services Agency (BASSA) was authorized by the Legislature and approved by the Governor in 1971. The enabling legislation requires BASSA to adopt a regional water quality management plan 'not later than January 1, 1974'. The development of the BASSA regional plan is closely related to the development of the Water Quality Management Plan for San Francisco Bay Basin (Basin Plan). The Basin Plan which is being managed by the State Water Resources Control Board will cover some of the principle subjects which BASSA's regional plan must cover. Therefore, to minimize duplication of State-BASSA planning and to preclude divergence of our plans, BASSA will not undertake its regional plan until the Basin Plan is more fully developed. This document contains two distinct parts: (1) BASSA's initial (1973) regional plan; and (2) BASSA's operating policies. The former is intended to satisfy BASSA's legislative mandate until the full regional plan is adopted. The latter is necessary to provide cohesion in the Agency's operations and to permit close coordination with other agencies. The authorization and the purpose of the plan are discussed. It is intended that this 1973 initial BASSA Plan serve as a guide for ongoing planning, including development of the Basin Plan. It is also the Agency's intention that the completed Basin Plan supersede this document. Specific features of the 1973 initial BASSA plan are listed. (Poertner)
W75-07132

REGIONAL SERVICES PROGRAM, FISCAL YEAR 1974-75,
Bay Area Sewage Services Agency, Berkeley, Calif.
P. C. Soltow, Jr., and D. F. Murphy.
March, 1974. 9 p, 1 tab.

Descriptors: *Administration, *Discharge water, *Water quality control, *Water management(Applied), *Water reuse, *Wastewater treatment, Runoff, Infiltration, Inflow, Monitoring, Urban runoff, Coordination, Data storage and retrieval, California, Regional development, Bays.
Identifiers: *San Francisco Bay, Regional services.

The regional services program has set as its goal the assistance of local and subregional agencies in the development and adoption of water quality management programs which will adequately protect the environment, be cost-effective and efficient, and reclaim and reuse wastewater and residuals. The proposed regional services of first priority for the fiscal year 1974-75 are described. These programs include a revision of all self-monitoring programs for waste dischargers, the implementation of wastewater reclamation plans, operator training, regional evaluation of residuals management, and project coordination. Proposed regional services of a second priority are given also. These include control of industrial wastes at their sources, review the new techniques that improve efficiency of wastewater management, the development of an information data bank, management of unsewered areas, investigations of urban runoff, and the assistance of local agencies in the solution of infiltration/inflow problems. The manpower needs and the activities chart for the planning department are shown. The appendix contains a table of the responsibilities of water quality agencies and a chart of the interrelationships of water quality plans. (Poertner)
W75-07133

LAND APPLICATION ALTERNATIVES FOR WASTEWATER MANAGEMENT.
Army Engineer District, San Francisco, Calif.
December 1973. 21 p, 17 fig, 5 tab, 1 append.

Descriptors: *Water reuse, *Sludge disposal, *Environmental control, *Social aspects, *Sewage treatment, *Sludge treatment, Sewage disposal, Waste disposal, Comprehensive planning, Alternative planning, California.
Identifiers: *Land application of wastewater.

In November of 1971, the United States Congress requested that the Corps of Engineers conduct a study of water quality and waste disposal problems related to wastewater management in the San Francisco Bay and Sacramento - San Joaquin Delta Region. Specific tasks assigned the Corps were the development of land application alternatives for treatment processes, disposal of sludge, wastewater reclamation and reuse. These tasks were to be carried out with considerations for the environmental quality, social well-being and regional development. The alternatives presented are comprised of combinations of land application and conventional sewage treatment plants. The land treatment process utilizes the entire biosystem, including the soil and its vegetative cover, to purify the wastewater. The wastewater is renovated primarily by three basic internal mechanisms operating within the soil, namely plant uptake; filtration, cation exchange and fixation; and reactions with soil microorganisms. The Corps found that land application alternatives could produce an effluent comparable to tertiary treatment. The method could also be used for ultimate disposal of sludge. No adverse, major socio-ecological or economic factors were identified that would negate wastewater management by land application. The reclaimed water could be put to beneficial uses. (Poertner)
W75-07135

MATHEMATICAL MODELS OF MAJOR DIVERSION STRUCTURES IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWER SYSTEM,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5D.
W75-07142

DEVELOPMENT OF A COMPUTER PROGRAM TO ROUTE RUNOFF IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWERS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5D.
W75-07143

REAL-TIME ESTIMATION OF RUNOFF IN THE MINNEAPOLIS-ST. PAUL METROPOLITAN AREA,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
G. S. Harris.
Memorandum No. 119, December 1968. 10 p, 4 tab, 4 fig, 14 ref.

Descriptors: *Water pollution control, *Rainfall-runoff relationships, *Interceptor sewers, *Computer programs, *Hydrographs, *Urban hydrology, Diversion structures, Mathematical models, Routing, Minnesota, Runoff, Combined sewers.
Identifiers: Real-time computations, Runoff hydrographs, St. Paul(Minnesota), Minneapolis(Minnesota).

The problem of computing runoff from the rain gage readings and the method which has been initially adopted for computing runoff in real time are discussed for the Minneapolis-St. Paul area. The mathematical model involves three basic components: (a) runoff, (b) diversion, and (c) routing of storm runoff. The runoff analysis, involving urban hydrology, was the main subject of the study. At the present time the runoff analysis is incomplete in that it does not include an evaluation of the rainfall losses. Due to the fact that very little information was available on the hydrologic characteristics of the catchments in the Twin City area and because the 'real time' analysis requires short computation time, it was decided to use a rather simple and direct approach for part of this initial hydrologic computation. The triangular unit hydrograph was selected with this in mind. A computer program has been written to evaluate the runoff hydrographs in the 15 main catchments using rainfall excess. Basically, the program reads the input data which include area, Thiessen polygon factors, time base, and time-to-peak for each unit hydrograph. The program then reads the rain gages and computes the hydrographs at the downstream ends of the 15 catchments. (Poertner)
W75-07144

THE REAL-TIME COMPUTATION OF RUNOFF AND STORM FLOW IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWERS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
C. E. Bowers, G. S. Harris, and A. F. Pabst.
Memorandum No. M-118, December 1968. 23 p, 20 fig, 2 tab, 14 ref.

Descriptors: *Combined sewers, *Water pollution control, *Rainfall-runoff relationships, *Computer programs, *Data storage and retrieval, *Data processing, Computers, Sewers, Minnesota, Interceptor sewers, Runoff, Mississippi River, Sanitary engineering, Sewerage, Hydrology.
Identifiers: Real-time computation, Minneapolis(Minnesota), St. Paul(Minnesota).

Modern techniques and methods of analysis were applied to an existing combined sewer system in Minneapolis and St. Paul. The goal was to find ways to increase the effectiveness of the system in collecting sewage and reduce the amount of pollution of the Mississippi River. The analytical studies were initially concerned with the theoretical concepts involved in computing the amount of water from rainfall which enters the sewer system and in determining the way in which the consequent flood hydrographs travel through the system. The method developed involves an electronic computer to read the rain gages and compute the runoff, including an evaluation of the loss of rainfall due to infiltration and other losses. It will then compute the amount of flow which is diverted to the interceptor sewers at the diversion structures. To do this the program requires information on the heights of the various gates and Fabridams in the system. Finally the program must check whether the flow depth or rate exceeds certain predetermined levels. If it does, gate settings must be adjusted and certain parts of the computation must be repeated. The theories which govern the rainfall runoff relationship, the diversion structures and the routing are discussed. In most areas some confirmation is needed using field data. (Poertner)
W75-07145

OPTIMUM DEVELOPMENT OF GROUND WATER FROM THE COASTAL AQUIFERS OF DELAWARE; WHERE, HOW MUCH, AND FOR HOW LONG CAN WE SAFELY PUMP OUR COASTAL AQUIFERS,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 4B.
W75-07149

PRELIMINARY REVIEW OF USED LUBRICATING OILS IN CANADA,
Environmental Protection Service, Ottawa (Ontario).
D. J. Skinner.
Report EPS 3-WP-74-4, June 1974. 112 p, 64 ref, append.

Descriptors: *Oil, *Oil pollution, *Oil wastes, Water pollution control, Soil contamination, Pollutants, Oil industry, Fuels, Chemical wastes, Heavy metals, Natural resources, Recycling, Legal aspects, *Canada.

The problem of waste lubricating oil is one that shares many features with the major resource and environmental concerns of our time. A survey of the present situation in Canada was presented including overall volumes, chemical compositions, current and end-uses and disposal methods, and a brief look at existing legislation. The shortcomings of present methods were examined and promising areas of investigation were highlighted. A need at all levels of government was recognized for comprehensive and effective regulations covering oil and other liquid wastes both to minimize health and environmental hazards and to rationalize the storage and transportation of such wastes. (Sims-ISWS)
W75-07151

WATER QUALITY DIMENSIONS OF WATER RESOURCES PLANNING,
North Carolina Water Resources Research Inst., Raleigh.
D. H. Howells.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY2, Proceedings Paper 11146, p 277-284, February 1975. 9 ref, 1 append.

Descriptors: *Hydrologic cycle, *Land use, *Water quality, *Water resources, *Planning, Agricultural watersheds, Hydrology, Low-flow augmentation, Nitrogen, Phosphorus, Precipitation(Atmospheric), Sediments, Soil erosion, Storm runoff, Streamflow, Land resources, Water pollution.
Identifiers: National Environmental Policy Act.

The traditional and unnatural separation of water quality planning from water resource planning was pointed to as a major obstacle to the achievement of integrated and economical solutions of land and water resources management problems. Principles of the hydrologic cycle were used as a prespective on opportunities for more imaginative treatment of water quality in land and water resources than are presently utilized. Management of pollution from non-point sources should focus on available land-water management techniques rather than end-of-the-line treatment of polluted runoff. The magnitude of the water quality problem and the limited resources available to deal with it rule against arbitrary positions by regulatory agencies restricting the range of socially acceptable alternatives for water quality management. All means, including low streamflow augmentation, should be considered in order to reach least-cost solutions. Land use, water quality, and water resources planning remain badly fragmented at high cost to the public. (Harmeson-ISWS)
W75-07185

A WASTE ASSIMILATIVE CAPACITY MODEL FOR A SHALLOW, TURBULENT STREAM,
Marquette Univ., Milwaukee, Wis.
For primary bibliographic entry see Field 5B.
W75-07268

EFFECTS OF RESERVOIR CLEARING ON WATER QUALITY IN THE ARCTIC AND SUBARCTIC,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W75-07272

ENVIRONMENTAL INVENTORY AND ASSESSMENT, ILLINOIS WATERWAY; 12-FOOT CHANNEL NAVIGATION PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-07288

ON THE THEORY OF NATURAL SELF-PURIFICATION OF RESERVOIRS,
For primary bibliographic entry see Field 5C.
W75-07300

WATER QUALITY MODEL OF THE LOWER FOX RIVER, WISCONSIN,
Environmental Protection Agency, Washington, D.C. Office of Enforcement and General Counsel.
For primary bibliographic entry see Field 5B.
W75-07327

FORMALIN AS A THERAPEUTANT IN FISH CULTURE,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 5C.
W75-07342

ECONOMIC IMPACT STUDY OF THE POLLUTION ABATEMENT EQUIPMENT INDUSTRY.
Little (Arthur D.), Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-225 841, $8.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Washington, D.C., Report 230/9-73-030, December 1972. 283 p, 20 fig, 62 tab, 24 ref. EPA 68-01-0553.

Descriptors: *Pollution abatement, *Industries, *Equipment, *Economic impact, Air pollution, Water pollution control, Standards, Instrumentation, Chemicals, Waste water treatment, Profit, Marketing.

The demand and impact analyses of the pollution abatement industry are performed under assumptions of three alternative futures for the 1972-80 period. (1) Baseline--extrapolates pollution abatement activity from a base year predating major environmental legislation, (2) Federal Compliance Schedule--simulates on-time enforcement of existing standards, and, (3) Expected Compliance Schedule--reflects the contractors' forecast of what may alternatively occur. The industries analyzed include air pollution control equipment (for particulate and gaseous emissions from stationary sources), water pollution control equipment, instrumentation for air and water pollution abatement, and chemicals for water pollution control. The industry is analyzed by its structure, its markets, and its performance. The demand is examined for air pollution control, municipal sewage treatment, industrial sewage treatment, and water and wastewater chemicals. The industry's impact analysis is based on supply curves, price effects, and employment effects. In all of the industrial sectors except water and wastewater chemicals, the Federal Compliance Schedule threatens to create a booming industry through 1975 or 1976, thereafter quickly falling to a situation of low operating rates, low profits, and venture failures. (Auen-Wisconsin)
W75-07345

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

PUERTO RICO WATER RESOURCES PLANNING MODEL PROGRAM DESCRIPTION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-06934

INSTITUTIONAL INTERACTION IN METROPOLITAN WATER RESOURCE PLANNING,
Metropolitan Council, St. Paul, Minn. Comprehensive Planning Dept.
For primary bibliographic entry see Field 6E.
W75-06939

CROSS-IMPACT SIMULATION IN WATER RESOURCE PLANNING,
Stanford Research Inst., Menlo Park, Calif.
P. G. Kruzic.
IWR Contract Report 74-12, Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, November 1974. 20 p, 7 fig, 6 tab, 14 ref, append.

Descriptors: *Water resources, *Alternative planning, *Simulation analysis, Computer programs, Forecasting, Mathematical models, Projects, Assessment, *Methodology, Effects, Regional development, Systems analysis, Equations, *Long-term planning, *Cities, Urbanization.
Identifiers: *Cross-impact simulation, Long-range changes, Long-term impact.

Described is KSIM, a computerized simulation planning procedure, and its application to a water resources problem. The procedure allows structuring and analyzing relationships among broadly-defined variables in large socio-economic systems. It enables, first, definition and structuring of a set of variables describing a perceived problem, and then calculation and display of the changes in the variables over time. By observing the changes and then making modifications, a model can be developed to test various alternatives and improve problem understanding. KSIM aids water resource planners in identifying problems, formulating alternatives, and assessing the impacts and long-term consequences of those alternatives. Discussed is the application of KSIM to an urban water planning problem of assessing the effects of water resources development upon such urban considerations as provision of services, employment patterns, and changes in residential preferences. Seven interacting variables are defined in terms of perceived growth or decline levels. A cross-impact matrix is completed to establish the relationship between each pair of variables. An on-line computer program is used to project future conditions of the regional system. (Bell-Cornell)
W75-06940

FACTOR ANALYSIS OF SHORELINE PHYSIOGRAPHY AND PERCEPTION OF WATER LEVEL DRAWDOWN BY RESERVOIR SHORELINE RESIDENTS,
Toronto Univ. (Ontario). Faculty of Forestry.
For primary bibliographic entry see Field 4A.
W75-06945

PROBABILISTIC METHODS IN STREAM QUALITY MANAGEMENT,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-06946

REGIONAL IMPACT OF WATER RESOURCE INVESTMENTS IN A DEVELOPING AREA,
Geological Survey, Reston, Va. Water Resources Div.
E. Attanasi.
Water Resources Bulletin, Vol 11, No 1, p 69-76, February 1975. 2 tab, 7 ref, append.

Descriptors: *Impact, *Water resources development, *Investment, *Regional development, *Regression analysis, *Puerto Rico, Multiple-purpose projects, Income distribution, Economics, Mathematical models, Systems analysis.
Identifiers: Public investments, Regional industrialization, Developing economies, Location, Industrial patterns.

The process and pattern of regional economic growth in a developing area are intimately associated with new plant and industrial location decisions. Regional development and industrialization patterns are investigated and related via regression analysis to water resource investments for the island of Puerto Rico. Growth measures for the nine year period considered include the change in income generated by the local manufacturing sector and the change in the municipio's (analogous to U.S. counties) share of annual island income. Although study results indicate water resource investments have little immediate or short-term impact, significant relationships and variations in regional responses appear over longer periods of time. This is shown by applying a variation of Zellner's method of performing seemingly unrelated regressions jointly. By this method, subsets of parameter coefficients of specific economic variables were restricted across regional equations while unrestricted coefficients were interpreted as explaining systematic regional variations in response to public investment. Regional differences, obtained by using this method, are frequently neglected when simply examining the overall development process. In terms of policy implications, results show an apparent, significant relationship, over the period considered, between changes in the distribution of income and the pattern of water resource development. (Bell-Cornell)
W75-06948

THE USE OF STREAMFLOW MODELS IN PLANNING,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
B. B. Jackson.
Water Resources Research, Vol 11, No 1, p 54-63, February 1975. 1 tab, 53 ref.

Descriptors: *Streamflow, *Model studies, *Planning, *Synthetic hydrology, Simulation analysis, Equations, Systems analysis, Rivers, Dams, Design, Hydrologic data, Monte Carlo methods, Markov processes, Optimum development plans, Decision making.
Identifiers: *Hydrologic models, Model construction.

A large and growing number of models are available for generating synthetic streamflow traces for use in planning. A survey of these techniques suggests some general precepts for the construction and use of hydrologic models in planning. The first portion of this paper is a brief overview of some of the major families of models for synthetic hydrology; the second part attempts some generalizations on the basis of the experience to date with such streamflow models. Considered are: early work, and Rippl's mass curve analysis; the Hurst phenomenon; lag 1 Markov and related models; fractional noise models; and the broken line models. A distinction is drawn between descriptive models, which are intended to provide insights into the actual workings of some system, and prescriptive models, which are intended for use in planning and which need not mirror the actual workings of a system exactly. Data evaluation, model construction, the use of phenomenological arguments, and model testing and uses are discussed. Eight steps are suggested for the construction of new hydrologic models for planning. To illustrate the application of these principles in different planning situations, two other articles by B. B. Jackson consider the optimal design and operation of a single reservoir on a single stream, where the decision makers have different objective functions. (See W75-06545 and W75-06546) (Bell-Cornell)
W75-06949

A PROGRAMING MODEL FOR THE DESIGN OF MULTIRESERVOIR FLOOD CONTROL SYSTEMS,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-06951

A GEOMETRIC PROGRAMMING MODEL FOR OPTIMAL ALLOCATION OF STREAM DISSOLVED OXYGEN,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5D.
W75-06954

A KINETIC MODEL FOR DESIGN OF COMPLETELY-MIXED ACTIVATED SLUDGE TREATING VARIABLE-STRENGTH INDUSTRIAL WASTEWATERS,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 5D.
W75-06955

A DYNAMIC MODEL FOR WATER AND RELATED LAND RESOURCE PLANNING,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W75-06958

SIMULATION AS AN AID TO DECISION MAKING IN A WATER UTILITY,
Puerto Rico Aqueduct and Sewer Authority, Santurce. Planning Area.
R. E. Filardi, and W. J. O'Brien.
Water Resources Bulletin, Vol 11, No 1, p 131-147, February 1975. 5 fig, 4 tab, 11 ref.

Descriptors: *Water supply, *Decision making, *Simulation analysis, *Management, Time series analysis, Water distribution(Applied), Water treatment, Planning, Water quality, Water quantity, Water policy, Environment, Surface waters, Reservoirs, Computers, Mathematical models, Systems analysis.
Identifiers: *Water utilities, Regression equations, Simulation language.

Water utility managers would find their decision making activities greatly enhanced if provided with a set of techniques having the following characteristics: (1) the ability to procure information and knowledge about real-life systems; (2) the ability to promote analysis of the real-life system; and (3) the capacity of gauge the impact of decisions. A model/simulation is presented, having the capability to mime operational aspects of water supply systems. The simulation produces time series of what are considered relevant operational variables. These series are amenable to analysis of both static and dynamic effects of alternative policies, changing environmental conditions and varying parametric specifications. Because of its modular structure and the ad hoc programming language utilized, it offers great flexibility. The model is used to simulate a hypothetical water supply utility which is broken down into three logical sub-systems: water source, water treatment, and water distribution. The simulation model allows extensions, deletions, and modifications without consequent reformulation or extensive reprogramming. It performs a number of statistical tests useful for its own verification and validation. Discussed are possible uses of the model for planning, design and operation. The model could be used for optimization by stochastic approximation or search for optimal responses. (Bell-Cornell)
W75-06959

A SURROGATE-PARAMETER APPROACH TO MODELING GROUNDWATER BASINS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-06960

CAPACITY EXPANSION MODEL OF WATER RESOURCE FACILITIES FOR A MAJOR RIVER SYSTEM,
Texas Univ. at Austin. Coll. of Engineering.
D. M. Himmelblau, and W. G. Lesso.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-241 500, $7.50 in paper copy, $2.25 in microfiche. Completion Report, April, 1975, 224 p, 2 tab, 40 fig, 8 ref, 3 append. OWRT A-022-TEX(2) 14-31-0001-3844, 14-31-0001-4044.

Descriptors: *Mathematical models, *Linear programming, Water resources, Planning, *Optimization, *Texas, Flooding, Reservoirs, Recreation, Construction, Model studies, River basins.
Identifiers: *Trinity River basin(Tex), Sensitivity analysis, Water resource systems, Nonlinear programming.

The objective has been to develop a practical and effective strategy for the optical expansion of a complex water resources system. Certain linear and nonlinear programming techniques have been combined and extended so that they can serve as tools to improve the planning, design, evaluation, and management of complex water resources systems. An efficient computer code has been prepared to carry out some of the required numerical calculations. A mathematical model of the components of a river basin that is compatible with the optimization strategy has been prepared. Practical optimization requires suitable mathematical models of the system. An integral relationship exists between the models and the effectiveness of the scheme to optimize the system.
W75-07277

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: HYDRAULICS OF SURFACE WATER RUNOFF,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2A.
W75-07278

AN INPUT-OUTPUT MODEL OF THE LOWER RIO GRANDE REGION OF TEXAS,
Pan American Univ., Edinburg, Tex. School of Business Administration.
J. C. Murrell, R. B. Geenens, and R. N. McMichael.
Texas Interindustry Project Report, April 1972. 175 p, 16 tab, 36 ref, 2 append. HUD Sec. 701.

Descriptors: *Economic impact, *Planning, *Input-output analysis, *Texas, Regions, Methodology, Data collections, Agriculture, Labor supply, Export, Tourism, Foreign trade, Mexico, Oil industry, Employment, Import, Commercial shellfish, *Rio Grande River, Model studies.
Identifiers: Lower Rio Grande Region(Tex).

The development, functions, and use of an input-output model prepared for the Lower Rio Grande Region of Texas are explained. The model consists of five tables: (1) the Transactions Table, built by estimating dollar transactions in and outside the region, (2) a Direct Coefficients Table, derived by dividing the total industry purchase into each dollar amount, (3) the Direct and Indirect Effects Table is essentially a mathematical solution of the second table, i.e., a group of simultaneous equations is solved, (4) the Labor Coefficients Table which estimates the labor requirements, and (5) the Closed Model, which includes the households within the processing section and measures the interaction of the households with the original 71 industries in the processing section. The model provides a necessary tool for the choice of three possible alternatives facing the region, (a) some form of planned development must be substituted to change the natural development of the area, (b) the natural development can be influenced in other directions, and (c) manpower development can be used to reduce the social cost by producing changes within human resources that are consistent with the natural development of the economy. (Auen-Wisconsin)
W75-07348

6B. Evaluation Process

PROCEEDINGS - CONFERENCE ON PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING AND MANAGEMENT.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB241 276, $6.25 in paper copy, $2.25 in microfiche.Conference sponsored by Water Resources Research Institutes of Al, Fl, Ga, Ms, NC, SC, Tn, and Va, June 19-20, 1974. Report No UNC-WRRI-74-95, June, 1974, 194 p, Edited by James M. Stewart. OWRT A-999-NC(41).

Descriptors: *Social participation, *Planning, *Management, *Education, *Reviews, *Information exchange, Legal aspects, Social aspects, Institutions, Decision making, Research priorities, Public rights.
Identifiers: *Public participation.

The conference reviewed (1) the state of the art and (2) research needs in public participation in water resource planning and management. Papers and discussions were presented on 'Identification of Publics in Water Resource Planning,' 'Information Response and Interaction - Dialogue Aspects of Public Participation,' 'Accountability of Public Water Resource Agencies: Legal Institutions for Public Interaction,' 'Education of Planners and Managers for Effective Public Participation,' 'Education of Publics for Participation in Water Resource Policy and Decision-Making,' and 'Analysis of Public Participation Problem and Research Needs.' (See W75-06555 thru W75-06860) (McJunkin-North Carolina State)
W75-06854

IDENTIFICATION OF PUBLICS IN WATER RESOURCES PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center; and Georgia Inst. of Tech., Atlanta Dept. of City Planning.
G. E. Willeke.
In: Proceedings, Conference on Public Participation in Water Resources Planning and Management, Report No UNC-WRRI-74-95, p 3-18, 1974.

Descriptors: *Social aspects, *Project planning, *Methodology, *Public rights, Planning, Administration, Environmental effects, Professional personnel.
Identifiers: *Public participation, Publics, Community leaders, Interest groups.

It is futile to expect to fully identify all publics relevant to a water resources planning study, but necessary to strive for a suitable approximation appropriate to the planning task. Segments of a population (publics) should be identified, including: (1) major governmental units, (2) special interest groups, (3) local public interest groups, and (4) the 'unreachables' who have a stake in water resources planning but chose not to participate or to be informed. It is important to realize that individuals may be in more than one group, but the operation dynamics of each group should be understood. Does the leader adequately represent the group. What is their role. Frequently groups identify themselves, and this can be enhanced by asking participants to identify themselves and their affiliation(s). Publics can also be identified by a third

party such as a citizen committee which assists the planning agency by locating concerned publics. Planning staff can also identify those groups which must be considered in a particular project from lists of associations, maps showing affected geographic areas, and field interviews. Demographic analysis, especially from census data, is expecially helpful in locating publics who may not tend to be vocal but most be considered. Finally, historical analyses of past projects may help the planning staff to generate a list of concerned parties including those who may gain or lose from projects. Multiple channels of communication to the public should be employed in order to reach as many of these publics as possible. (See also W75-06854) (Herr-North Carolina)
W75-06855

INFORMATION RESPONSE AND INTERACTION - DIALOGUE ASPECTS OF PUBLIC PARTICIPATION,
North Carolina State Univ., Raleigh. Dept. of Sociology and Anthropology.
A. C. Davis.
In: Proceedings Conference on Public Participation in Water Resources Planning and Management, Report No UNC-WRRI-74-95, p 19-50, 1974. 11 fig, 7 ref.

Descriptors: *Structural models, *Project planning, *Social aspects, Management, Planning, Administration, Public rights, Professional personnel, Information exchange.
Identifiers: *Public participation, Public meetings, Information services, Interaction techniques.

Analysis of citizen participation techniques indicates a range of possible activities from an elitist authoritarian approach to various 'democratic' participatory approaches. Models are proposed to show variations in types of participation, timing, procedures, and groups involved. Information-response models, in which the planner generates plans and then seeks public reaction, tend to be one-way communication. Public hearings are usually employed. Cost is relatively low, but so is public representation. As more feedback is allowed and included in the planning process, more time and energy are consumed but the resulting plans should be a better representation of public needs and desires. Interaction-dialogue models involve a somewhat different role for the planner. He gathers information from relevant publics, formulates alternative plans, and subjects them to continuous review. The planner may act as coordinator and catalyst between various publics using workshops or other small group techniques. An ombudsman, representing the publics, may work with the planner. Or a process of plural planning may be used with each interested public offering its own plan and ultimately reaching a solution through compromise or the efforts of a hearing officer appointed to arbitrate. A state-of-the-art survey of water resources agency personnel shows that nearly all preferred personal contact as their primary source of input from others and nearly 3/4 preferred public meetings or hearings as the primary way to disseminate information. (See also W75-06854) (Herr-North Carolina)
W75-06856

ACCOUNTABILITY OF PUBLIC WATER RESOURCE AGENCIES: LEGAL INSTITUTIONS FOR PUBLIC INTERACTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
P. M. Ashton.
In: Proceedings Conference on Public Participation in Water Resources Planning and Management, Report No UNC-WRRI-74-95, p 51-75, 1974. 74 ref.

Descriptors: *Legal aspects, *Judicial decisions, *Legal review, Regulation, Equity, Constitutional law, Civil law, Common law, Public rights, Administration, Legislation, Project planning, Social aspects.
Identifiers: *Public participation, Administrative Procedures Act of 1966, Public trust doctrine.

Administrative agencies are substantially insulated from public intervention by national legal institutions. The courts have found no inherent public right to be involved in agency decision processes except as specifically allowed by law. Substantial problems are involved in seeking to force accountability through court action, including problems of standing, injury, judicial review, and statutory jurisdiction. Enabling legislation has established these regulatory and administrative agencies to isolate decision making and control from the political arena into efficient decision making units which are relatively free from the time consuming requirements of citizen participation. The Administrative Procedures Act of 1966 allows agencies considerable freedom in applying their own statutory requirements regarding who may intervene on a given matter. The public has little right to be involved unless a member of the public has substantial interest in the proceedings. Standing to seek judicial review is granted only where 'injury in fact' (in excess of $10.000 damage) of a specific plaintiff can be demonstrated. Agency actions may be reversed by the courts for being arbitrary and capricious, contrary to constitutional right, in excess of statutory jurisdiction, taken without compliance to procedural rules, or unsupported by substantial evidence. Potential improvements are discussed, including the public trust doctrine, common law remedies, a constitutional amendment, and an environmental court. (See also W75-06854) (Herr-North Carolina)
W75-06857

EDUCATION OF PLANNERS AND MANAGERS FOR EFFECTIVE PUBLIC PARTICIPATION,
Clemson Univ., S.C.
B. C. Dysart, III.
In: Proceedings, Conference on Public Participation in Water Resources Planning and Management, Report No UNC-WRRI-74-95, p 77-127, 1974. 7 tab, 3 append.

Descriptors: *Social aspects, *Education, *Training, Leadership, Professional personnel, Project planning, Methodology.
Identifiers: *Public participation, On-the-job education.

A mail questionnaire survey was used to assess the educational needs of water resource planners and managers in their development of public participation programs. Research in the 10-state South Atlantic-Gulf-Tennessee region identified approximately 20 key water resource people per state with representation from government agencies, private industry, and concerned citizen groups. Statistical analysis of responses revealed that individuals with an engineering background working for business or industry were more likely to have a poor attitude toward public participation than individuals with a non-engineering background. Public agencies, particularly at the state and federal levels, were more involved in public participation programs, apparently because these are needed to comply with requirements. At all levels a lack of sufficient technical capabilities was not seen as a problem. Areas of weakness include a need for better communication skills, lack of willingness to consider input from 'nonprofessionals', insufficient 'sensitivity' to changing goals of society, and 'attitudinal' maters in general. Educational programs to rectify these problems were proposed. Traditional lecture-type short courses were rejected. Attractive alternatives include: a seminar approach, a weekend retreat combining several groups, one-to-one visit with successful organizers of citizen participation, and self-study programs. The limited time available to members of the target audience must be recognized in any educational endeavor. (See also W75-06854) (Herr-North Carolina)
W75-06858

EDUCATION OF PUBLICS FOR PARTICIPATION IN WATER RESOURCE POLICY AND DECISION-MAKING,
Mississippi State Univ., Mississippi State. Social Science Research Center.
P. J. Ross.
In: Proceedings Conference on Public Participation in Water Resources Planning and Management, Report No UNC-WRRI-74-95, p 129-164, 1974. 2 tab, 2 fig, 36 ref.

Descriptors: *Social aspects, *Project planning, Administration, Methodology, Public rights, Planning, Decision making.
Identifiers: *Public participation, Public meetings, *Information programs, Mass media, Communication, Army Corps of Engineers.

A study of agency public participation programs, especially those of the U.S. Army Corps of Engineers, reveals a shift from dealing with the public as 'informed observer' to 'citizen participant.' In the 1960's the public was involved through hearings which were often poorly publicized and so late in the planning process that they served more as review sessions than active participation in plan formulation. In the '70's efforts have been made to involve the public early in the project problem analysis phase. Meetings latter present alternative solutions as they are worked out and the solution ultimately selected before the report is finalized. Standard reports have been supplemented with various innovations including brochures outlining pros and cons of each alternative and a mail-in feedback portion, distributed at public meetings and to interested groups. Other education/information mechanisms include the media, printed materials, public meetings and hearings, small group discussions, and personal contacts. Of these, the media provide the widest coverage but personal contacts are probably used most for input from interests outside the agency. Although efforts have been made to increase public participation they have resulted mainly in generating public interest and involvement but not in mustering support of public acceptance of agency proposals. More involvement throughout the planning process is needed; specific suggestions for types of involvement at each step of the planning process are given. (See also W75-06854) (Herr-North Carolina)
W75-06859

ANALYSIS OF PUBLIC PARTICIPATION PROBLEMS AND RESEARCH NEEDS.
In: Proceedings, Conference on Public Participation in Water Resources Planning and Management, Report No UNC-WRRI-74-95, p 185-189, 1974.

Descriptors: *Research and development, *Conflicts, *Project planning, Analytical techniques, Economics, Planning, Management, Methodology, Social aspects, Research priorities.
Identifiers: *Public participation, Public access to information.

Increased public involvement holds much promise for better public policies and programs, but broad public participation in water resources planning and management is still largely untried in a systematic way, in part because this is a relatively recent phenomenon. Several types of programs to increase public participation are listed and possible consequences identified. Planners, managers and various publics would be educated by the process. Various publics, both accepting and hostile, would be identified. Public participation would increase but so might problems of maintaining a properly balanced and concerned relationship. With the increasing responsiveness and accountability of these programs come higher agency costs in time and resources. For all of these assorted outcomes to be sufficiently predictable under various geographical and situational conditions further research will be required. Empirical study is also necessary to establish guidelines as to

what experts and activists include in their judgments of 'meaningful and effective' public participation. Criteria and guidelines for the design and evaluation (including cost effectiveness) of public participation programs are needed. Research could include ex post facto studies of public participation programs and cooperative studies with agencies through design of programs to meet operational as well as research objectives. Research should seek to minimize public frustration, conflict, and delay of water resource projects. (See also W75-06854) (Herr-North Carolina)
W75-06860

ECONOMIC CRITERIA FOR FRESHWATER WETLAND POLICY IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
T. R. Gupta, and J. H. Foster.
American Journal of Agricultural Economics, Vol 57, No 1, p 40-45. February 1975, 4 tab, 12 ref. OWRT B-023-MASS(13), 14-31-0001-3596.

Descriptors: *Wetlands, *Economics, *Wildlife, *Aesthetics, *Flood control, *Evaluation, Northeast United States, *Massachusetts, Benefits, Costs, Preservation, Decision making, Water policy, Cost-benefit analysis.

The value of wildlife, visual-cultural benefits, water supply and flood control benefits of wetlands (varied by benefit productivity levels) are determined with help from appropriate scientists. Comparison of benefit value with opportunity cost of wetland preservation is demonstrated as the basis for decisions concerning permits for wetland alteration. The analysis suggests that 90% of the wetlands in the state of Massachusetts should be preserved. (Larson-Massachusetts)
W75-06896

THE NEED FOR A COMPREHENSIVE APPROACH IN THE MANAGEMENT OF ENVIRONMENTAL RESOURCES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W75-06938

WATER MANAGEMENT IN CHINA, TOP PRIORITY FOR 2500 YEARS,
Northern Illinois Univ., De Kalb. Dept. of Geography.
For primary bibliographic entry see Field 3F.
W75-06942

FORECASTING INDUSTRIAL WATER UTILIZATION IN THE PETROLEUM REFINING SECTOR: AN OVERVIEW,
New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3E.
W75-06944

A PRESENT VALUE-UNIT COST METHODOLOGY FOR EVALUATING MUNICIPAL WASTEWATER RECLAMATION AND DIRECT REUSE,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Sanitary Sciences Div.
For primary bibliographic entry see Field 5D.
W75-06947

AN ECONOMIC ANALYSIS OF WATER RESOURCE INVESTMENTS AND REGIONAL ECONOMIC GROWTH,
Wisconsin Univ., Madison. Dept. of Economics.
C. J. Cicchetti, V. K. Smith, and J. Carson.
Water Resources Research, Vol 11, No 1, p 1-6, February 1975. 7 tab, 14 ref.

Descriptors: Water resources, *Investment, *Regional economics, *Multiple-purpose projects, *Southwest U.S., *Economic impact, Estimating, Human population, Measurement, Cost allocation, Behavior, Equations, Arid lands, Systems analysis.
Identifiers: Economic analysis, Economic growth, Economic subregions, Cobb-Douglas function, Production function, Sensitivity, Change, Pooled data.

Effects are analyzed of the Bureau of Reclamation's water resource projects over the period 1930-70 on regional economic growth in the southwestern United States. The overall five-state area selected for analysis is one of general, or at least seasonal, water shortage. Thus, water management is expected to have greater influence on regional economic activity there than in less arid regions. The unit of observation for analysis is an economic subregion, consistent with the specific projects involved and theoretical models of growth centers. Behavioral relationships are more closely tied to the body of economic theory developed for modeling regional economic growth. With the use of composite computer mapping techniques, three characteristics have been utilized to define the economic regions: population density, irrigated croplands, and highway accessibility. The effects of water investments are examined in two ways: studying the determinants of the level of economic activity in a subregion at a given time; and focusing on the measured changes in the level of economic activity over time. Conventional economic analysis is performed to derive production functions. Results show that water resource investments have an impact on regional economic growth. The extent of the effect depends on the nature of the water investment, the state of the regional economy, and the amount and nature of other investments. (Bell-Cornell)
W75-06952

WATER MANAGEMENT--A GENERAL REPORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W75-06953

SIMULATION AS AN AID TO DECISION MAKING IN A WATER UTILITY,
Puerto Rico Aqueduct and Sewer Authority, Santurce. Planning Area.
For primary bibliographic entry see Field 6A.
W75-06959

THE HANLON CREEK STUDY: AN ECOLOGICAL APPROACH TO URBAN PLANNING,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
E. E. Mackintosh.
Journal of Soil and Water Conservation, Vol 29, No 5, p 277-280, November-December 1974. 5 fig, 6 ref.

Descriptors: *Small watersheds, *City planning, *Water conservation, *Ecology, Ecosystems, Watersheds(Basins), Urbanization, Groundwater recharge, Natural recharge, Streamflow, Runoff, Water table, Recreation facilities, Social needs, Parks, *Canada.
Identifiers: *Hanlon Creek(Ont).

Hanlon Creek, a small watershed on the southern fringe of Guelph, Ontario, drains an area of 7300 acres. At the moment, the watershed is predominantly agricultural. The city annexed part of the watershed in response to forecasted expansion of industry and housing. Location of an expressway within the watershed boundaries precipitated the events leading up to the investigation being undertaken. The study was undertaken to determine the effect of the Hanlon Expressway on the ecology of Hanlon Creek, and to determine the effect of long-range urbanization on the ecology of Hanlon Creek. Based on the inventory analysis, a series of recommendations can be generated that allows development to proceed within a framework that assures the preservation of natural systems. Most importantly, the procedure assures urban dwellers of adequate open space and recreational activities. (Sims-ISWS)
W75-07067

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT,
Coastal Zone Management Inst., Sandwich, Mass.
For primary bibliographic entry see Field 2L.
W75-07075

WATER AND SEWERAGE DEVELOPMENT PLAN - KANSAS CITY METROPOLITAN REGION.
Metropolitan Planning Commission-Kansas City Region, Mo.
For primary bibliographic entry see Field 5D.
W75-07083

REPORT ON REGIONAL POLLUTION CONTROL: HALIFAX-DARTMOUTH METROPOLITAN AREA.
Halifax-Dartmouth Metropolitan Area Planning Committee (Nova Scotia). Task Group on Water Supply and Waste Disposal.
For primary bibliographic entry see Field 5D.
W75-07085

PLANNING FOR SHORELINE AND WATER USES.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11667, $3.25 in paper copy, $2.25 in microfiche. A Report on the Third Marine Recreation Conference, B. J. Cole, ed., Marine Advisory Service, University of Rhode Island, Kingston, Rhode Island, 1974. 20 p, append.

Descriptors: *Coasts, *Planning, *Water management(Applied), *Water demand, *Marinas, Shore protection, Recreation, Waste disposal, Water pollution control, *Northeast US.
Identifiers: *Coastal zone management.

One concern to coastal management and recreation interest groups is the role of government in coastal zone planning. To receive federal grants for coastal zone planning, states must meet federal criteria including coastal zone definition, areas of special environmental concern, and consideration of national interests as well as individual state objectives. Rhode Island is attacking coastal management problems one-at-a-time beginning with barrier beach development and progressing to sand and gravel industry regulations. Maine is formulating management plans on an area-by-area basis beginning with Penobscot Bay. A strong argument is presented to make recreation another objective of coastal zone management and to allow the marine recreation community to participate in discussions and hearings. Summaries of 'Planning, Politics and the Public' papers present the need of planning to control resource demands, population growth and commercial development. In an increasingly crowded and polluted environment, new methods must be found to compensate land owners for severe restrictions on the use of their property. The importance of the marina industry on the economy of the New England region, where New Hampshire alone reported $11.2 million total sales of boats, supplies and services, was emphasized. The effects of resin and fuel shortages are beginning to reduce boat building and use of marine recreation facilities. Charging for pumping of boat waste holding tanks into tank trucks, cooperation among several marinas to build a single waste treatment facility and leak-and-rust-proof gas and diesel storage tanks are suggested to improve marinas. Proposals were made for considering water user fees for marinas

and other marine facilities to help finance new facilities and/or coastal zone management. (Salzman-North Carolina)
W75-07086

PROCEEDINGS OF THE WORKSHOP ON RESEARCH NEEDS RELATED TO WATER FOR ENERGY.
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 6D.
W75-07089

RESEARCH NEEDS RELATED TO HYDROLOGIC ASPECTS OF WATER FOR ENERGY FROM LARGE ENERGY COMPLEXES,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6D.
W75-07093

RESEARCH NEEDS ON SOCIAL, POLITICAL AND INSTITUTIONAL ASPECTS OF COAL UTILIZATION,
Kentucky Univ., Lexington. Center for Developmental Change.
For primary bibliographic entry see Field 6D.
W75-07096

RESEARCH NEEDS ON ECONOMIC AND RESOURCE MANAGEMENT ASPECTS FOR COAL GASIFICATION/LIQUEFACTION,
Tennessee Univ., Knoxville. Appalachian Resources Project.
S. L. Carroll.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign. Research Report No. 93, p 156-165, November, 1974. 1 fig, 64 ref.

Descriptors: Economics, Benefits, Costs, *Economic efficiency, Coals, Oil, *Oil industry, Energy, *Energy conversion, *Cost-benefit analysis, *Econometrics, Economic impacts, Transportation, Demand, *Research priorities.
Identifiers: *Coal gasification/liquefaction, Systems approach, General equilibrium overview, Industrial organization analyses, Econometric demand and supply analysis.

To replace oil importation by gasification of coal, annual new coal production must exceed 725,000,000 tons and will cost nearly 6 times as much as energy derived from Mideast oil. Types of magnitudes that are involved in large-scale coal gasification are reviewed, and recommendations for economic research to make this process feasible in supplanting oil are outlined. The following areas suggest means to assess the industry: a systems approach to the establishment of a coal gasification industry, a general equilibrium overview of such as industry, and extensive industrial organization analysis. Central feature of the systems analysis outlined by a chart dealing with coal production in Appalachia is the use of the cost-benefit criterion for evaluation of various abatement strategies. In the general equilibrium overview, an eclectic approach to the energy industry uses econometric demand and supply analysis as well as programming techniques to determine efficient methods of transportation. Industrial organization analysis demands studies of the behavior, structure, distribution of resources and ownership, and future performance of the coal gasification industry. A bibliography covering various techniques to coal gasification and the economic impact is included. (See also W75-07089) (Salzman-North Carolina)
W75-07097

EFFECTS OF IRRIGATION DEVELOPMENT ON TRADE PATTERNS AND INCOME GENERATION,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
T. A. Hertsgaard.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 472, $3.75 in paper copy, $2.25 in microfiche. Research Report No. WI-222-004-74, November, 1974. 23 p, 1 fig, 6 tab, 3 ref. OWRT B-003-NDAK(3).

Descriptors: Economics, *Economic impact, Benefits, Community development, *Input-output analysis, *Irrigation, *North Dakota, *Income analysis, Model studies, Cost analysis, Industry, Farm management.

Expenditures data were collected from a sample of farms, nonfarm, firms, households, and local units of government in a seven-county area in northeastern North Dakota. Input-output technical coefficients and interdependence coefficients were computed from these data and were not found to differ significantly from those obtained in a previous study of southwestern North Dakota. Interdependence coefficients were applied to levels of output of the basic sectors of each region and the state for the years since 1958. The resulting estimates of personal income were compared with those developed by the Bureau of Economic Analysis, U.S. Department of Commerce, to determine the degree of validity of the input-output model for estimating gross outputs of the respective sectors in the state. The comparisons indicated the input-output model provided estimates of personal income that averaged within about 4.8 percent of Department of Commerce estimates at the state level. Estimates at the regional level were less reliable, especially for those regions in which petroleum mining is an important sector. However, the model appeared to be satisfactory for estimating the economic effects of irrigation or coal resource development.
W75-07104

REGIONAL SEWAGE TREATMENT NEEDS FOR EUGENE-SPRINGFIELD URBAN AREA.
CH2M/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 5D.
W75-07119

WASTE WATER MANAGEMENT - IMPLICATIONS FOR REGIONAL PLANNING,
For primary bibliographic entry see Field 8A.
W75-07120

ADVANCED PLANNING OF FLOOD CONTROL PROJECTS,
Santa Clara County Flood Control and Water District, San Jose, Calif.
G. Korbay, J. Richardson, M. Burns, C. Church, and E. Ferguson.
December 1970. 35 p, 37 tab, 1 append.

Descriptors: *Planning, *Flood control, *Cost comparisons, *Project planning, *Priorities, *Alternative planning, Project feasibility, Project purposes, Future planning(Projected), Net income, Construction costs, California, Financing, Scheduling.
Identifiers: Santa Clara County(California).

In the past the Flood Control District's staff has recognized the need for a five-year advance construction schedule, and proposed schedules have been drawn up for each of the five flood control zones. Each zone schedule was submitted to the appropriate zone Advisory Committee for review and comment. The Committee-approved schedules have been submitted to the Board of Supervisors (formerly the governing body of the Flood Control District) and more recently the Board of Directors for adoption as District policy. The zone schedules were prepared by a staff 'Task Force'. The activities of the Task Force fall within three general categories; Procedure, Methods of Financing and Recommendations. Procedure includes the mechanics of determining the net funds available for construction in each fiscal year. A detailed description of the procedure and methodology used to establish the net income, project priorities and scheduling of the high priority projects is contained in the Appendix. Secondly, the alternative methods of financing flood control projects were investigated and are summarized in the Appendix. The Task Force recommends a five-year construction schedule for each zone for consideration by the Flood Control Zone Advisory Committees under an adopted policy framework by the District Board of Directors. (Poertner)
W75-07139

HYDROELECTRIC DEVELOPMENT OF THE NELSON RIVER SYSTEM IN NORTHERN MANITOBA,
Manitoba Hydro, Winnipeg.
For primary bibliographic entry see Field 6G.
W75-07172

WATER QUALITY DIMENSIONS OF WATER RESOURCES PLANNING,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 5G.
W75-07185

KONA DAM VS. KONATOWN: A SOCIOLOGICAL INTERPRETATION OF SELECTED IMPACTS OF RESERVOIR DEVELOPMENT ON A COMMUNITY FIELD,
East Texas State Univ., Commerce. Dept. of Sociology and Anthropology.
R. N. Singh.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-241 489, $7.00 in paper copy, $2.25 in microfiche. Completion Report, February 1975, 175 p., 6 fig, 2 maps, 24 tabl, 51 ref, 4 append. OWRT C-4059 (no. 9011) (1).

Descriptors: Social aspects, *Environmental effects, Ecology, Institutional constraints, Economic impact, Projects, Evaluation, *Alternative planning, Multiple-purpose reservoirs, *Social impact, Social values, Social needs, Community development.
Identifiers: *Environmental impact, Delphi procedures, Public projects.

The study was aimed at identifying a set of procedures useful for the delineation of environmental impacts of a public project from a sociological perspective. The research process included three major procedures: (1) analysis of Kona Dam as an action process in terms of its major phases, activities and behaviors involved during its history; (2) identification of Konatown as a community field in terms of its major constituent elements at ecological, institutional, and social levels of analysis; and (3) study of an interaction between Kona Dam and Konatown, mainly in terms of the impacts of the former on the latter. By using an 'action guide', it was possible to collect systematically in a historical manner selected data concerning Kona Dam Project. The action project was discussed in terms of major phases, namely: (1) initiation, (2) organization of sponsorship, (3) goal setting or planning, (4) implementation of plans, and (5) evaluation of the project. Delphi procedures were used during action analysis to identify and rank the dam's goals, environmental impacts, and alternatives. The procedures identified and ranked systematically eleven goals of the project, forty-four of its environmental impacts (past and future), and eleven plausible alternatives to it. After the selected characteristics of the community field of Konatown were identified, it was possible to see which of those charac-

teristics had already been, or might in the future be, affected by the dam project.
W75-07271

GILA RIVER BASIN, NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA: ALTERNATIVE PLANS FOR FLOOD CONTROL AND RECREATIONAL DEVELOPMENT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-07331

NATURAL RESOURCES MANAGEMENT IN THE GREAT LAKES BASIN,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6E.
W75-07344

INDUSTRIAL WATER DEMAND FORECASTING,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
For primary bibliographic entry see Field 6D.
W75-07346

THE CALIFORNIA STATE WATER PROJECT IN 1970.
California State Dept. of Water Resources, Sacramento.
Bulletin 132-70, June 1970. 244 p, 8 fig, 17 tab, 4 append.

Descriptors: *California, *Water resources development, *Projects, Financing, Bond issues, Interest rates, Recreation, Wildlife, Fisheries, Hydroelectric plants, Dams, Power marketing, Aqueducts, Flood control, Right-of-way, Canals, Pumping plants, Alternative planning, Agricultural runoff, Cost repayment, Water reuse, Water storage, Irrigation, Contracts, Income, Capital costs, Operation and maintenance, Water allocation(Policy), Cost allocation.

This eighth annual Project report documents progress during 1969; it updates long-range financial projections and provides data and computations to support those charges to be assessed water service contractors during 1971. Project management centered on alleviating an immediate financial problem induced by the inability to market $600 million in general obligation bonds within the statutory 5% interest ceiling. Ninety percent of those facilities required to fulfill initial water delivery commitments in 1973 were either completed or under contract; those declared operational in 1969 triggered guaranteed minimum payments of $16.15 million annually. Operations included 284,246 acre-feet of water delivered from project facilities; 1,554,800 recreation days provided by project lakes, and 2,614,000,000 kilowatt-hours of electric energy generated at project powerplants. As of 1970, estimated capital costs to be incurred for the entire Project (1952-1985) totaled $2,837 million, exclusive of future costs to be financed by revenue bonds. Of this estimation, $1,676 million had been incurred to 1970. Assuming legislative approval to raise the statutory interest ceiling on general obligation bonds, sufficient funds should be available to complete the '1973 Project Facilities.' Water charges to be assessed during 1971 will total about $55 million; through 1971, payments will have totaled about $228 million. (Auen-Wisconsin)
W75-07347

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

METROPOLITAN WATER SUPPLY ALLOCATION AND OPERATION,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W75-06851

A PRESENT VALUE-UNIT COST METHODOLOGY FOR EVALUATING MUNICIPAL WASTEWATER RECLAMATION AND DIRECT REUSE,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Sanitary Sciences Div.
For primary bibliographic entry see Field 5D.
W75-06947

AN ECONOMIC ANALYSIS OF WATER RESOURCE INVESTMENTS AND REGIONAL ECONOMIC GROWTH,
Wisconsin Univ., Madison. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-06952

COST OF TRICKLING FILTER RECIRCULATION PART I,
For primary bibliographic entry see Field 5D.
W75-06956

COST OF TRICKLING FILTER RECIRCULATION PART II,
For primary bibliographic entry see Field 5D.
W75-06957

WATER USE AND COAL DEVELOPMENT IN EASTERN MONTANA: WATER AVAILABILITY, WATER DEMANDS AND ECONOMIC IMPACTS,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6D.
W75-06978

EFFLUENT TREATMENT AND ITS COST FOR THE SYNTHANE COAL-TO-SNG PROCESS,
Bureau of Mines, Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W75-07098

THE CHARACTERISTICS AND ULTIMATE DISPOSAL OF WASTE SEPTIC TANK SLUDGE,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W75-07273

LIFE HISTORY, ECOLOGY, AND MANAGEMENT OF THE SMALLMOUTH BUFFALO, ICTIOBUS BUBALUS (RAFINESQUE), WITH REFERENCE TO ELEPHANT BUTTE LAKE,
New Mexico Agricultural Experiment Station, University Park.
D. B. Jester.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10265, $5.25 in paper copy, $2.25 in microfiche. Research Report 261, September 1973. 111 p, 26 fig, 43 tab, 119 ref.

Descriptors: *Fish management, *Buffalo fish, *Commercial fish, Life history studies, Ecological distribution, Growth rates, Spawning, Fish diets, Fish populations, Fish diseases, Fish harvest, Fishing gear, Systematics, Reservoirs, Pounds fish per acre, Carp, Carpsucker, *New Mexico. Identifiers: *Elephant Butte Lake(NM), Smallmouth buffalo fish.

Investigations of smallmouth buffalo fish in a New Mexico reservoir are combined with available literature, to include life history, population ecology, commercial value, and management methods. Reported range of the species is modified to extend the western boundary into Montana, New Mexico, and west of the Continental Divide into central Arizona. Age-growth studies revealed a large increase in growth rates as a direct result of reduced population density, or indirectly, the result of commercial harvest. While buffalo required two to 11 years to reach a weight of 1,000 grams in nine waters, time required to reach this weight decreased from nine years to six in Elephant Butte Lake after three years of commercial fishing. Spawning habitat and behavior, sex ratios, maturity, fecundity, and food and feeding habits are discussed. The smallmouth buffalo has a market value adequate to justify small commercial fishing operations on a sustained yield basis. Market expansion is possible with development of a distribution system which will allow supplying buffalo to areas where demand appears to be consistent but is too small for a single fisherman to schedule regular deliveries. Buffalo are sold primarily as whole, dressed fish by Los Angeles' retailers at prices ranging from 26 cents/lb to 35 cents/lb. (Auen-Wisconsin)
W75-07343

ECONOMIC IMPACT STUDY OF THE POLLUTION ABATEMENT EQUIPMENT INDUSTRY.
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W75-07345

AN INPUT-OUTPUT MODEL OF THE LOWER RIO GRANDE REGION OF TEXAS,
Pan American Univ., Edinburg, Tex. School of Business Administration.
For primary bibliographic entry see Field 6A.
W75-07348

COST-EFFECTIVE DESIGN OF WASTEWATER TREATMENT FACILITIES BASED ON FIELD DERIVED PARAMETERS.
Saint Louis Metropolitan Sewer District, Mo.
For primary bibliographic entry see Field 5D.
W75-07349

6D. Water Demand

A SUMMARY VIEW OF WATER SUPPLY AND DEMAND IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
S. E. Rantz.
San Francisco Bay Region Environment and Resources Planning Study Basic Data Contribution 47 (U.S. Geological Survey open-file report), 1972. 41 p, 4 fig, 16 tab, 7 ref.

Descriptors: *Water supply, *Water demand, *California, Water resources development, Water yield, Water utilization, Safe yield, Consumptive use.
Identifiers: *San Francisco Bay area(Calif).

The water-supply situation in the nine counties that comprise the San Francisco Bay region, California is summarized. Water data are based on 1970 conditions. Firm water supply is tabulated for each subregion by source--ground water, surface water, and imported water. Water demand in 1970 is tabulated for each subregion by type of use or demand--public supply, rural self-supply, irrigation, self-supplied industrial water, and thermoelectric power generation. The San Francisco Bay region is dependent to a large degree on imported water. Under 1970 conditions of develop-

ment, the firm water supply is 2.2 million acre-feet per year; of that quantity, almost 1 million acre-feet per year is imported water. The water demand in 1970 was 1.9 million acre-feet, about half of which was consumed. Under 1970 conditions of water development and use, a series of dry years would probably necessitate some curtailment of irrigation activities in four of the subregions, where the bulk of the demand is for irrigation water. Under those same conditions there is generally ample water for municipal and industrial use throughout the region. Although the firm water supply of the San Francisco Bay region, including imported water, is generally adequate to meet present needs, supplemental supply would be required to meet increased demand. The expansion of existing surface-water facilities and the construction of new surface-water projects, now considered feasible, could provide a combined firm supplemental yield of slightly more than 1 million acre-feet per year. (Knapp-USGS)
W75-06935

FORECASTING INDUSTRIAL WATER UTILIZATION IN THE PETROLEUM REFINING SECTOR: AN OVERVIEW,
New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3E.
W75-06944

A DYNAMIC MODEL FOR WATER AND RELATED LAND RESOURCE PLANNING,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
T. Liang, and W-y. Huang.
Water Resources Bulletin, Vol 11, No 1, p 33-48, February 1975. 14 fig, 13 ref.

Descriptors: *Water resources, *Planning, *Demand, *Supply, Natural resources, *Land resources, *Dynamic programming, Storage, Control, Model studies, Constraints, Optimization, Feasibility studies, Water utilization, Evaluation, Agriculture, Land development, Planting management, Reservoirs, Equations, Systems analysis, Cost analysis, *Hawaii.
Identifiers: Resource demand, Multiple cropping, Natural resource capacity, Hawaii, Truck crops, Environmental quality.

By the control or selection of types and levels of activities, resource activity demands can be modified to best suit the storage-modified fluctuating resource supply. Manipulation of the supply: demand relation decreases resource waste and reduces the need for, and construction of, large and expensive storage facilities. Planning an optimal system of activities for generating economic goods and services within an existing natural resource capacity is a difficult problem to solve. A dynamic programming model with the capacity to check multiple resource demand and supply compatibility over many time periods has been developed for solution of this type of problem. The characteristics of natural resource supply and the demand of activities have been utilized to reduce the number of time periods and to minimize the loss of the dynamic reality of the problem. Reduction in the number of time periods extends the capability of the model to the solution of complex resource planning problems without oversimplification. The model has been applied to the town of Kamuela on the island of Hawaii, where a small reservoir has been constructed for the purpose of developing vacant land into a vegetable producing area. The model is useful in studying the feasibility of developing the unused land. (Bell-Cornell)
W75-06958

WATER USE AND COAL DEVELOPMENT IN EASTERN MONTANA: WATER AVAILABILITY, WATER DEMANDS AND ECONOMIC IMPACTS,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
P. E. Polzin.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 331, $7.50 in paper copy, $2.25 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Report No. 57, November 1974. 223 p, 2 fig, 70 tab, append. OWRT C-5258(No. 4217)(1).

Descriptors: *Strip mines, *Coal mines, *Water requirements, *Economic impact, Economic predictions, *Montana, *Water demands, Great plains, Energy, Costs.
Identifiers: Northern Great Plains(Mont), Coal-water relationships, Coal-energy production.

A one-year study was conducted to assess Montana's role in the national energy picture (particularly from the standpoint of strip-coal mining development); to describe the region in terms of economy, agriculture, water use and people, with a section on the Indian population; and to project the impact of coal-related development in terms of coal mining, electrical generation and gasification. Included in the projected impact were studies of future levels of coal development, coal-related employment and earnings, total employment, population and income, and water use increases. Findings were classified according to two alternative projections for coal development in Montana for 1980 and 1985 (Alternative 1 - no gasification) and (Alternative 2 - with gasification). Under alternative 1, Montana coal production was projected to be 49 million tons per year (1980) and 61 million tons (1985). Under alternative 2, production was projected to be 57 million tons per year (1980) and 77 million tons (1985). Additional water demand for the seven-county impact area studied was for alternative 1: 38,470 acre-feet (1980) and 57,670 acre-feet per year (1985). For alternative 2: 49,610 acre-feet (1980) and 80,020 acre-feet per year (1985). The study concludes that this water is available, but that reservoir storage may have to be provided to assure a stable supply.
W75-06978

WATER USE AND COAL DEVELOPMENT IN EASTERN MONTANA: WATER AVAILABILITY AND DEMANDS,
Montana State Univ., Bozeman. Dept. of Economics and Agricultural Economics.
R. L. Stroup, and S. B. Townsend.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 332, $4.75 in paper copy, $2.25 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Completion Report No. 59, December 1974. 89 p, 1 fig, 36 tab, 13 ref. OWRT C-5258(No. 4217)(2).

Descriptors: *Coal mines, *Strip mines, *Water supply, *Water requirements, *Water demand, *Competing uses, Water allocation(Policy), *Montana, *Water availability, *Water utilization, Costs.
Identifiers: *Coal development, Fort Union Formation(Mont), Coal gasification, Mine-mouth generation.

A one-year, two-phase study was undertaken to assess the availability and demand for water in the coal region of eastern Montana. The physical availability of surface and ground water was treated, as were the legal problems associated with coal development, broken down by type of development. Data presented indicate that sufficient groundwater is available in eastern Montana to permit substantial amounts of coal development. Use of this water would not be without cost, however. Direct costs of impoundment and delivery, and foregone opportunities for using the water instream must be considered. Increased costs and decreased availability of irrigation water, problems caused for aquatic ecosystems, reduced availability of water for some types of recreation, loss of hydropower downstream, possible shortening of the navigation schedule, and the increased need for sewage treatment are all potential problems to be considered when deciding how much water should be used for coal development. The demand for water in coal development will depend in part on the cost of water to developers. For any given type of coal conversion plant which might be proposed, there is considerable flexibility in the extent of water use. Information on the location, size, and timing of coal development and water demands is of great concern to planners. But much more data must be developed if accurate forecasts are to be made. (Williams-Montana State)
W75-06979

GOALS, POLICIES AND MANAGEMENT OF WATER RESOURCES IN THE RIO GRANDE VALLEY (APJ-1).
Middle Rio Grande Council of Governments of New Mexico, Albuquerque; and Herkenhoff (Gordon) and Associates, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W75-07084

PROCEEDINGS OF THE WORKSHOP ON RESEARCH NEEDS RELATED TO WATER FOR ENERGY.
Illinois Univ., Urbana. Water Resources Center.
Available from NTIS, Springfield, Va 22161 as PB-241 346, $8.75 PC, $2.25 MF. Workshop held in Indianapolis, Ind, Oct 20-22, 1974. Sponsored by Water Resources Center, Univ. of Ill. at Urbana-Champaign. Research Rept. No. 93. Nov. 1974. 297 p, 12 fig, 19 tab, 207 ref, append. Glenn E. Stout, ed. OWRT X-147(No 4271)(1).

Descriptors: *Energy budget, *Energy dissipation, *Energy conversion, *Research and development, Water resources, *Environmental effects, *Water requirements, Hydrologic aspects, Waste water treatment, *Research priorities, Social aspects, Legal aspects, Thermal pollution, Pollution, Economic impact.
Identifiers: *Coal gasification, *Coal liquefaction, *Coal conversion.

Development of large scale energy conversion facilities and their impact on water resources in the Ohio River, Great Lakes and Upper Mississippi River basins was studied at an interdisciplinary workshop. Within limits determined by available water resources and minimization of environmental impact, participants identified areas in which research will be needed if energy conversion facilities are developed. Coal gasification and liquefaction received special emphasis. Included are 2 papers on coal conversion processes and related water requirements, 9 papers with commentaries related to main topic and reports of discussion groups which identify research needs and rank them in importance. A summary of research needs includes: determination of availability and quality of water with respect to legal, social and environmental implications; study of character, transport, rate and environmental impact of coal conversion waste products; development of waste treatment; and a budget study to ensure optimum utilization and conservation. Papers provide information concerning technical, social, political, legal, institutional and environmental aspects of energy related water use and coal conversion technology. (See W75-07090 thru W75-07099) (Salzman-North Carolina)
W75-07089

COAL CONVERSION: PROCESSES, RESOURCE REQUIREMENTS, AND ENVIRONMENTAL IMPACT.
Illinois Univ., Urbana. Inst. for Environmental Studies.

In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign, Research Report No. 93, p 3-50, November, 1974. 8 fig, 9 tab, 39 ref.

Descriptors: *Energy conversion, Water resources, *Water supply, *Water requirements, Pollution, *Coals, *Economic impact, Economics, Environmental effect, *Research priorities.
Identifiers: *Coal conversion, High Btu gasification processes.

Coal, one of the nation's most abundant energy resources, is costly and requires extensive air quality controls because of its high sulfur content. Available information on the processes for gasifying and liquefying coal, the products and the possible consequences of coal conversion on resources, environmental quality and the economy has been condensed and assembled. An overview of coal production processes, followed by an assessment of the processes currently under development for the production of high and low Btu, are presented. Processes for converting coal to liquid and solid fuels are discussed complete with an analysis of factors influencing design and location of conversion plants. These factors are determined by availability of adequate resources and the effect of the plant on the whole environment. Each coal conversion process is reviewed by its process, state of development, water requirements, operation and its estimated costs. In the analysis of the various coal conversion processes such as High Btu gasification process (HYGAS), Koppers-Totzek process, Char Oil Energy Development conversion process and modified Lurgi process, water consumption needs and requirements as well as wastewater effluents and water losses are identified. The most efficient level of water utilization for a given facility at a given site should be based on relative supply and demand for water resources at the site. (See also W75-07089) (Salzman-North Carolina)
W75-07090

WATER REQUIREMENTS FOR A SYNTHETIC FUELS INDUSTRY BASED ON COAL,
Office of Coal Research, Washington, D.C.
E. Schmetz, and G. A. Mills.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign, Research Report No. 93, p 69-79, November, 1974. 4 tab, 7 ref.

Descriptors: *Water demand, *Water requirements, Research and development, Design, Coals, Energy, *Energy conversion, Pollution, Coal mines, Coal mine wastes, Effluents, *Research priorities.
Identifiers: *Coal gasification process, *Coal liquefaction process, Substitute natural gas(SNG), Coal conversion plants.

The Office of Coal Research (OCR) is working with industry to develop technology for maximum utilization of coal to alleviate the nation's energy problem in an environmentally acceptable manner. OCR's endeavors to develop the production of substitute natural gas (SNG) as well as fuel produced through liquefaction, and the subsequent water requirements of these processes are outlined. Water uses relate to the needs for gasification and liquefaction processes and to the effect of pollutants on water utilized in the conversion process and that associated with mining operations. Water needs for gasification of coal include inputs for cooling and clean-up of gases and by-products, and for the production of hydrogen. Three designs of gasifiers are used to produce SNG including the stirred fixed-bed gasifier, where oxygen and steam are passed through coal which sits on a grate; the entrained-flow gasifier (Koppers-Totzek), where pulverized coal is entrained in a stream of oxygen and steam through a nozzle into the gasifier where gasification of the coal occurs; and the fluid bed type, where a bed of pulverized coal is fluidized by the process gas. Water requirements for a 250,000,000 scf/day SNG-plant and time-frame and water needs for the first 90 SNG plants are given. Conversion of coal to liquid or low melting boiler fuels employs three processes: liquid-phase hydrogenative extraction of coal, liquid phase catalytic hydrodesulfurization and gas-phase fluidized-bed carbonization. Water requirements for liquefaction plants to the year 2000 are projected. Coal conversion plants require more research to develop a water treatment scheme to reuse waste water, to treat polluted water, and to introduce new technology to possibly change the production process. (Salzman-North Carolina)
W75-07091

RESEARCH NEEDS RELATED TO HYDROLOGIC ASPECTS OF WATER FOR ENERGY FROM LARGE ENERGY COMPLEXES,
Minnesota Dept. of Natural Resources, St. Paul.
G. H. Hollenstein.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign, Research Report No. 93, p 99-100, November, 1974.

Descriptors: *Hydrologic data, *Energy conversion, Energy, Power plants, Pollution, *Water utilization, *Water reuse, Costs, *Optimization, Water shortage, *Water demand, Weather modification, Precipitation(Atmospheric), Research and development, Technology, Water policy, Economics, *Research priorities.
Identifiers: Hydrometeorology.

Some research needs related to the solution of practical problems of large energy complexes are discussed. Proximity to energy sources requires development of a systematic program for evaluating the general availability and distribution plus the hydrologic characteristics of available water supplies involved in the siting of any major complex. To increase water uses yet conserve, new technology and innovative methodologies must be applied to water reuse; i.e., new methods to integrate present uses and wastewater discharges with energy water needs, to recapture and reuse water lost through evaporation and other processes, and to recycle and store groundwater supplies. Atmospheric weather modification to supplement water supplies is another area where new methods and techniques to analyze possible results should be developed. One of major research needs is to develop rational, functional programs which will integrate greater and more efficient production of energy with as little hydrologic and environmental impairment as possible by the most economical means. (See also W75-07089) (Salzman-North Carolina)
W75-07093

RESEARCH NEEDS RELATED TO HYDROMETEOROLOGIC ASPECTS OF FUTURE ENERGY PRODUCTION,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
S. R. Hanna.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign, Research Report No. 93, p 102-107, November, 1974. 19 ref.

Descriptors: Energy, *Energy dissipation, Heat, *Heat flow, *Dispersion, Atmosphere, Clouds, Fog, *Meteorology, *Thermal pollution, Water cooling, Thermal power plants, Research and development, Model studies, Air pollution, Path of pollutants, Cooling towers, *Research priorities.
Identifiers: Cooling ponds, *Coal gasification, Power parks.

Increasing use of water in cooling waste heat has generated greater thermal pollution as well as demands for more water. The environmental modification by cooling towers and ponds is reevaluated. Although cooling towers cause the development of small cumulus clouds and contribute to intense fog, atmospheric effects of waste heat dissipation are currently observed to be of only slight significance. Because increases in waste heat are expected, more research is needed to evaluate its environmental effects. Waste heat from coal gasification, power plants, and from large energy centers is evaluated in relation to its dissipation and effect on the atmosphere. Specific calculations help determine the environmental impact of these emissions dealing with plume rise, cloud formation, ground cover fog and drift deposition. Recommended research, listed by priorities, includes: the study of cloud formation by multiple cooling tower plumes; the testing of a cloud-growth model; development of dispersion theory to calculate fog increases; the measuring of drift deposition; and development of models of plumes from cooling towers and heat rejections from cooling ponds for observation of heat budget terms. (See also W75-07089) (Salzman-North Carolina)
W75-07094

RESEARCH NEEDS RELATED TO HEAT DISSIPATION FROM LARGE POWER PLANTS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W75-07095

RESEARCH NEEDS ON SOCIAL, POLITICAL AND INSTITUTIONAL ASPECTS OF COAL UTILIZATION,
Kentucky Univ., Lexington. Center for Developmental Change.
S. Johnson, and A. Randall.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign, Research Report No. 93, p 137-153, November, 1974. 2 fig, 24 ref, 1 append.

Descriptors: Coals, *Energy conversion, *Economic impacts, Social aspects, *Social impact, Community development, Employment opportunities, Area redevelopment, *Cost-benefit analysis, Research and development, Legislation, Human resources, Regional economics, Political aspects, Institutions, Governments, Environmental impacts, Environmental control, *Research priorities.
Identifiers: *Coal gasification.

The value of a natural resource is determined by the interactions of scarcity, technology and human value systems. The impact of the development of coal conversion processes in the more humid eastern half of the United States is discussed. Intending to provide a perspective on requirements needed to achieve a desirable balance between energy supply, environmental protection and the social and economic well-being of people affected by the coal complex, past experience and the present situation of the coal mining industry are outlined. Cost-benefit analysis serves as an important tool to measure the impact of the coal-mining industry on the regional economic activity. The introduction of large scale coal conversion and increased mining activity will result in an increased population as well as other consequences to rural areas. Land speculation, an inevitable result, forces those newly employed and those displaced because of site selection, to pay higher prices for building costs and land sites. Demand for public and private services far exceeds the ability and revenue sources of the community to provide them. To estimate these and other possible effects, a coal gasification plant planned for Western Kentucky was analyzed. Research must be directed toward creating temporary systems to handle stress in construction phase, to develop laws and

regulations, to identify policy incentives for coal industry to behave in the interest of the community, and finally, to assess the impacts of industrial expansion on environmental protection, economic diversity, and problems of rapid growth. (See also W75-07089) (Salzman-North Carolina)
W75-07096

RESEARCH NEEDS ON ECONOMIC AND RESOURCE MANAGEMENT ASPECTS FOR COAL GASIFICATION/LIQUEFACTION,
Tennessee Univ., Knoxville. Appalachian Resources Project.
For primary bibliographic entry see Field 6B.
W75-07097

EFFLUENT TREATMENT AND ITS COST FOR THE SYNTHANE COAL-TO-SNG PROCESS,
Bureau of Mines, Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W75-07098

RESEARCH NEEDS RELATED TO THE ENVIRONMENTAL ASPECTS OF COAL GASIFICATION/LIQUEFACTION,
Hittman Associates, Inc., Columbia, Md.
C. W. Mallory, T. R. Mills, and D. Emerson.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign. Research Report No. 93, p 184-196, November, 1974. 2 tab.

Descriptors: *Coal mines, Coals, *Energy conversion, *Environmental effects, *Sites, *Research and development, Energy, Reclamation, Waste treatment.
Identifiers: *Coal gasification, Coal refineries, Coal liquefaction, Appalachia, Eastern Interior, Fort Union, Powder River, Four Corners.

Under the auspices of the Office of Coal Research, a study of the environmental aspects associated with the siting, construction and operation of large scale coal refineries was conducted to identify environmental effects and to define the magnitude of these effects. Approaches used to mitigate adverse environmental consequences are defined. Five major coalbearing regions (Appalachia, Eastern Interior, Fort Union, Powder River and 4 Corners) having reserves adequate to support a number of large scale coal refineries were considered. Major environmental issues considered in planning and siting of large scale coal refinery complexes include creation of new industrial areas, influx of population, commitment of large quantities of water, land disturbance, modification of natural drainage, generation of waste products, and destruction of terrestrial and aquatic habitats. Each issue is detailed in terms of the environmental, economic, and social ramifications of the coal plant on an area. For example, a coal refinery and power plant requires large amounts of cooling water as well as water for consumptive uses resulting from increased population. This water need will necessitate the siting of coal complexes with regard to the long term commitment to fill all water requirements. Although major environmental issues have been defined, basic and applied research will be needed to develop approaches, strategies and policy options that will be required. (See also W75-07089) (Salzman-North Carolina)
W75-07099

THE CALIFORNIA WATER PLAN, OUTLOOK IN 1974,
California State Dept. of Water Resources, Sacramento.
C. A. McCullough, and J. D. Voyder.
Bulletin No. 160-74, November, 1974. 64 p, 10 fig, 21 tab.

Descriptors: *Planning, *Water supply development, *Water quality, *Conservation, *Potential water supply, Projections, Water allocation(Policy), Water conservation, Water requirements, Water supply, Water utilization, California, Long-term planning, Water resources development, Alternate planning.
Identifiers: *California water plan.

In California, the status of developed and available water supplies compared to present demands for water is still favorable. The situation affords time for consideration of all alternative sources for future water supply, including techniques for more efficient use of water to reduce demands. This outlook is premised on completion of Auburn Dam on the American River, New Melones Dam on the Stanislaus River, and Warm Springs Dam on Dry Creek in the Russian River Basin, and the Peripheral Canal being constructed and in operation by 1980. How long this condition lasts depends on the completion of additional water conveyance facilities needed to deliver already regulated supplies. No new water projects that would develop additional supplies of any significance have been authorized. The quality of the State's water supply is generally quite satisfactory, with the significant exception of the Colorado River and some localized ground water problems. The quality is expected to be maintained and improved as the result of the basin plans for water quality management currently being developed by the State Water Resources Control Board. While the urban areas of the State should experience no significant or extensive water shortages during the next 20 years, the outlook for any large expansion is not optimistic. (Poertner)
W75-07134

DAVIS COUNTY COMPREHENSIVE STUDY, 1972 UPDATE CULINARY WATER, PRESSURE IRRIGATION WATER, SANITARY SEWERAGE.
Davis County, Salt Lake City, Utah.
1972. 27 p.

Descriptors: *Domestic water, *Water supply, *Irrigation systems, *Sewerage, *Utah, *Water distribution(Applied), *Potable water, Water allocation(Policy), Water quality, Municipal water, Comprehensive planning, Cities.
Identifiers: Davis County(Utah).

The inventory for the years of 1971 and 1972 of all water systems in Davis County, Utah, has been updated. This includes the culinary water system, pressure irrigation water system and the sanitary sewerage system. Also, the supply, storage and distribution of each water system has been evaluated. Statements of present adequacy and projections are based upon this evaluation. Each system has been evaluated in light of its own situation and in relation to the Weber Basin Project which is a country-wide system. For each city in Davis County, data is given on the growth of the city in terms of residential units, commercial or industrial expansion, and a projection of the population by 1990. The inventory and any projected plans for the supply, storage and distribution of water are given for each city. Also included is information on whether grants have been used or applied for. Weber Basin should be able to furnish water to the cities, districts and private companies as the needs arise. Weber Basin has applied for a grant to HUD for construction of a 6,000,000 gallon reservoir to serve several cities in Davis County and Weber County. This project will enable Weber Basin to meet increasing demands as the area continues to grow. (Poertner)
W75-07140

INDUSTRIAL WATER DEMAND FORECASTING,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
D. M. Tate, and R. Robichaud.
Social Science Series No. 10, 1973. 23 p, 4 fig, 1 tab, 16 ref.

Descriptors: *Model studies, *Industrial water, *Water demand, *Forecasting, Water costs, Water consumption, Comprehensive planning, Water management(Applied), Water conservation, Municipal water, Water shortage, Capital costs, Evaluation, Water supply, Water users, Water distribution, Water rates, Competing uses, Recreation.

A simulation model was developed to forecast industrial water demand in Canada in order to avoid severe water shortages, anticipate conflicting water demands, increase the scope of comprehensive water resource planning, and evaluate the effects of government policy in the water management field. Water-use coefficients and water pricing and cost were judged to be unsatisfactory techniques for forecasting water demands. The water-use coefficients lose accuracy when applied to regional areas and water pricing and cost rely on a circular argument. The proposed simulation model, however, utilizes a module approach, emphasizing flexibility in the number of factors included, and the precision of the relationships. The model is discussed in terms of its verification, versatility, responsiveness to government policy, expandability, information requirements, and limitations. A lack of background information on several important parameters of the model, and on water cost as it affects demand, limits the specific application of the model for high precision uses. Several sample applications of the model were analyzed, and the extension of the model to some industrial sectors and to the municipal sector is demonstrated. (Becker-Wisconsin)
W75-07346

6E. Water Law and Institutions

PROCEEDINGS - CONFERENCE ON PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING AND MANAGEMENT.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 6B.
W75-06854

ACCOUNTABILITY OF PUBLIC WATER RESOURCE AGENCIES: LEGAL INSTITUTIONS FOR PUBLIC INTERACTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W75-06857

EDUCATION OF PUBLICS FOR PARTICIPATION IN WATER RESOURCE POLICY AND DECISION-MAKING,
Mississippi State Univ., Mississippi State. Social Science Research Center.
For primary bibliographic entry see Field 6B.
W75-06859

FDA'S PROGRAM OF MERCURY IN FOODS,
Food and Drug Administration, Seattle, Wash.
For primary bibliographic entry see Field 5G.
W75-06905

INSTITUTIONAL INTERACTION IN METROPOLITAN WATER RESOURCE PLANNING,
Metropolitan Council, St. Paul, Minn. Comprehensive Planning Dept.
I. T. Ball.
Water Resources Bulletin, Vol 9, No 3, p 529-537, June 1973. 4 ref.

Descriptors: *Water resources, *Management, *Planning, *Minnesota, *Water policy,

Watershed(Basins), Local governments, Regional analysis, Political aspects, Coordination, Institutions, Cities.
Identifiers: *Metropolitan planning, *Institutional coordination, Political interaction, Behavioral sciences, *Minneapolis-St. Paul(Minn).

Methods of institutional coordination derived from the applied behavioral sciences have been useful in determining the policy planning and implementation responsibilities that must be shared between local governments, water districts, and a regional planning body in the Minneapolis-St. Paul area. The confines of the traditional behavioral science models of organizations and institutional change process, and the realities of administrative systems imbedded in political processes at both the local and state levels, have created conflicts between regional planners, watershed district staff and consultants, and municipal administrators. Recently, there has been a sharp curtailment of watershed district powers. Reported is a recently completed study on the Twin Cities area which considered the major institutional problem areas. A conceptual framework was developed and applied to two watershed districts, and the results evaluated for other research purposes as well as for policy development for the 1973 Minnesota legislative session. Needed are increased flexibility and adaptation to change, less formality, and consideration of a wide range of public interests in the formulation of public policy for water resource management. The conceptual framework provides an alternative to the traditional Weberian bureaucratic model, characterized by an emphasis on rationality, a strict hierarchical system of authority, efficiency, and formal rules. (Bell-Cornell)
W75-06939

VANVOOREN V. JOHN E. FOGARTY MEMORIAL HOSPITAL (ACTION FOR DAMAGES AND RELIEF FROM POLLUTION OF ARTESIAN WELL).
321 A.2d 100 (R.I. 1974).

Descriptors: *Rhode Island, *Judicial decisions, *Oil pollution, *Artesian wells, *Legal aspects, Water law, State jurisdiction, damages, equity, Oily water, Water pollution, Water pollution sources, Oil, Land tenure, Adjacent land owners, Subsurface waters, Groundwater, Water rights, Overlying proprietor, Legal review, Water pollution effects, Water quality, Potable water, Adjudication procedure, Water quality control.
Identifiers: *Liability(Legal aspects).

The plaintiff landowner sought equitable relief and money damages from an adjoining landowner and a corporation, both defendants herein. The plaintiff alleged that the defendants were negligent in the manner in which they repaired a fuel oil leak in the adjacent landowners furnace. The lower court directed verdicts in favor of both defendants and the plaintiff appealed. The Supreme Court of Rhode Island held that the evidence failed to show that the corporate defendant had any duty to the plaintiff to replace soil saturated with spilled oil after it had repaired the oil leak. The court further held that the evidence did present a jury question as to whether the adjacent landowner had exercised reasonable care in attempting to prevent contamination of the well. Accordingly, the judgment as to the corporate defendant was affirmed and the judgment as to the adjacent landowner was reversed and the case remanded for further proceedings. (Deckert-Florida)
W75-06962

HENDRICKSON V. WILSON (ACTION TO ENJOIN HARBOR EXPANSION PENDING IMPACT STATEMENT).
374 F Supp 865 (W.D. Mich 1973).

Descriptors: *Harbors, *Engineering structures, *Shore protection, Environmental quality, *Recreation, Aesthetics, Natural resources, Recreation demand, Recreation facilities, Social aspects, Social impact, Judicial decisions, Bodies of water, Marinas, Regulation, Water resources development, Michigan, Water law.
Identifiers: *Environmental Impact Statements, NEPA.

Action was brought by property owners to enjoin state agencies and the Army Corps of Engineers from proceeding with the contemplated expansion of a harbor until an environmental impact statement could be filed in accordance with federal and state law. Plaintiffs alleged that the harbor construction with its boat launching and docking facilities had precipitated a breakdown of the area's septic systems and had caused the pollution of the surrounding environment. They contended that the expansion involved both federal and state action and that the plan would affect the surrounding human environment. The United States District Court upheld the determination of the Corps of Engineers that the proposed construction of additional offshore mooring facilities in the harbor was not major federal action significantly affecting the quality of the human environment. Therefore, no environmental impact statement was required prior to construction. (Proctor-Florida)
W75-06963

STATE BOARD'S DISCRETIONARY POWER TO PENALIZE POLLUTERS DECLARED INVALID.
Pollution Control Guide, Vol 3, paragraph 19913, p 19725-19726, 1974.

Descriptors: *Illinois, *Judicial decisions, *Adjudication procedure, *Legislation, *Administrative agencies, Administration, Adoption of practices, Legal aspects, State governments, Standards, Water pollution sources, Legal review, Water pollution control, Water law, Law enforcement, Regulation, Penalties(Legal), Jurisdiction, Water quality control, Water quality standards, Constitutional law.
Identifiers: Injunctive relief, Liability(Legal aspects), Administrative regulations.

The Illinois Fifth District Appellate Court has recently ruled that the Illinois Pollution Control Board has the power to determine if the state's Environmental Protection Act has been violated, but may not impose penalties on parties found to be in violation of the standards. Provisions of the Act which gave the Board unfettered discretionary power to set penalties effected an unconstitutional delegation of legislative and judicial authority. The lack of standards to guide the Board was the fatal weakness in the statutory plan. In one of two decisions, the court said that an administrative agency's imposition of a discretionary penalty constituted an unconstitutional exercise of judicial power which violated the Illinois Constitution's doctrine of separation of powers. Although it determined that the Pollution Control Board could not penalize the manufacturer, the court did not discuss other enforcement powers of the Board such as the authority to enjoin any person who violates a provision of the Act. (Sperling-Florida)
W75-06964

SMITH V. JACKSON PARISH SCHOOL BOARD (ACTION FOR DAMAGES TO POND CAUSED BY DEFECTIVE SEWAG SYSTEM).
300 So 2d 252 (La App 1974).

Descriptors: *Water pollution, *Judicial decisions, *Water pollution sources, Ponds, *Louisiana, Sewage disposal, Sewers, Sewage, Engineering structures, Negligence, Legal aspects, Water quality control, Water law.
Identifiers: *Nuisance, *Contamination.

Plaintiff, owner of a pond adjacent to a school, brought suit against the School Board seeking injunctive and monetary relief for injury caused by a defective sewage system on School Board Property. The trial court awarded money damages and enjoined the School Board from further contaminating plaintiff's pond. On appeal the trial court was affirmed as to the measure of damages, but reversed as to the grant of permanent injunctive relief. The court held that since the contamination had ceased it was improper to order the Board to prevent acts which were no longer occurring. (Proctor-Florida)
W75-06965

AMERICAN PAPER INSTITUTE V. TRAIN (ACTION SEEKING REVIEW OF WATER POLLUTION EFFLUENT LIMITATION GUIDELINES FOR THE PAPER INDUSTRY).
381 F Supp 553 (D D C 1974).

Descriptors: *Judicial decisions, *Legal review, *Water quality standards, *Water pollution control, *District of Columbia, Water pollution sources, Effluents, Regulation, Water law, Water pollution, Adoption of practices, Administrative agencies, Federal Water Pollution Control Act, Permits, Administration, Standards, Adjudication procedure, Legal aspects, Water quality control, Federal jurisdiction.
Identifiers: *FWPCA Amendments of 1972, Administrative regulations, Effluent limitations, Environmental policy, Standing(Legal).

A paper manufacturer brought action in federal district court seeking review of water pollution effluent limitation guidelines promulgated by the Environmental Protection Agency. The court held that if the challenged regulations were guidelines, and as such only aids in establishing standards of performance for the issuance of permits, the paper company was not adversely affected by the issuance of the regulations and thus could not seek judicial review. If the regulations were limitations, which the court held them to be, review could only be by a United States Court of Appeals. The 1972 Ammendments to the Federal Water Pollution Control Act provide that judicial review of the limitations be by United States Courts of Appeal. When Congress has specified a procedure for judicial review of administrative action, courts will not make non-statutory remedies available without a showing of patent violation of agency authority. (Sperling-Florida)
W75-06966

STATE OF NEW YORK V. BISHOP (ACTION BY STATE ON TRESPASS FOR FILLING BELOW HIGH WATER MARK OF BAY).
359 N Y S 2d 817 (S Ct 1974).

Descriptors: *Riparian rights, *Erosion, *New York, Judicial decisions, Land tenure, Soil erosion, Waves(Water), Tides, Shores, Navigable waters, Bays, Bodies of water, Trespass, Public rights, Public access, Water pollution.
Identifiers: *Mean high water mark, Nuisance(Legal aspects).

An action was brought by the State of New York alleging trespass by defendant property owner in filling in property below the high water mark of the bay on gounds that the area was not owned by defendant but constituted underwater land owned and held in trust by the town's trustees. The complaint also alleged that the defendant had created and maintained a public nuisance, and had polluted the waters of the state. The court held a 1950 title registration judgment did not bind the state to the location of the mean high water mark described therin since defendant held a title diminshable in extent by erosion and consequent influx of the tide. Also held that the erosion of defendant's parcel carried with it all incidents of ownership, including the right of reclamation. (Proctor-Florida)
W75-06967

ILLINOIS SUPREME COURT OK'S PCB'S POWER TO FINE POLLUTERS.
For primary bibliographic entry see Field 5G.
W75-06968

BROWN V. RUCKELSHAUS (AND COMPANION CASE) (CHALLENGE TO EXECUTIVE IMPOUNDMENT).
For primary bibliographic entry see Field 5G.
W75-06969

CAMPAIGN CLEAN WATER, INC. V. RUCKELSHAUS (CITIZENS SUIT ON IMPOUNDMENT OF FWPCA FUNDS.)
For primary bibliographic entry see Field 5G.
W75-06970

THE CITY OF NEW YORK, ET AL. V. RUCKELSHAUS (IMPOUNDMENT OF FEDERAL WATER POLLUTION CONTROL ACT FUNDS).
For primary bibliographic entry see Field 5G.
W75-06971

CALVERT CLIFFS COORDINATING COMMITTEE, INC., ET AL. V. UNITED STATES ATOMIC ENERGY COMM'N., ET AL. (ENFORCEMENT OF THE NATIONAL ENVIRONMENTAL POLICY ACT).
For primary bibliographic entry see Field 6G.
W75-06972

TOWARD CLEANER WATER.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-06973

VANCE V. KASSAB (SUIT TO RESTRAIN DEFENDANT FROM CONSTRUCTING DRAIN PIPE WHICH WOULD DISCHARGE ON PETITIONER'S LAND).
325 A.2d 924 (Common Ct. Pa. 1974).

Descriptors: *Pennsylvania, *Conduits, *Waste water disposal, *Administrative agencies, *Judicial decisions, Pipelines, Remedies, Construction, Adjacent landowner, Roads, State jurisdiction, Constitutional law, Equity.
Identifiers: Injunctive relief(Legal aspects), Sovereign immunity, Statutes.

An action was brought to enjoin the Pennsylvania Department of Transportation and a roadbuilder from constructing a pipe to drain water from a township road. The court held that the Secretary of Transportation had specific statutory authority to arrange for construction of a pipe to drain water from a township road. If construction of the pipe caused a discharge of water onto the plaintiff's land, the state would be obligated to file a declaration of taking. The plaintiffs then would have the right to file objections to the power or right of the state to appropriate property. Since an adequate statutory remedy was available equitable relief was denied. (Sperling-Florida)
W75-06974

POWER SHORTAGE CONTINGENCY PROGRAM FOR THE PACIFIC NORTHWEST, LEGISLATIVE, REGULATORY AND INSTITUTIONAL ASPECTS,
Kell, Alterman, Runstein and Thomas, Portland, Oreg.
L. Jourolmon, L. B. Day, C. P. Thomas, L. D. Kell, and J. F. Adamson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 323, $10.50 in paper copy, $2.25 in microfiche. Completion Report, 1975. 370 p, 5 fig, 19 tab, 147 ref, append. OWRT C-5049(No. 4226)(1).

Descriptors: *Columbia River, Legal aspects, *Pacific Northwest US, *Electric power production, *Legislation, *Nuclear energy, Regulation, Treaties, Streamflow, Federal Power Act, Energy, Institutions, *Hydroelectric power, Public utility districts, River basin development, Public utilities.
Identifiers: Public utility commissions, Federal Power Commission, Solar power, Power shortages, *Power curtailment, Power rationing.

The potential electric power shortage threatened by the critical regional streamflows in the season of 1973 was studied. It was assumed that the region could experience a series of crises which could not be met by the combined regional power capability. The Pacific Northwest is served by a hydroelectric system owned by the Federal Government, privately owned utilities, public agencies, municipalities, cooperatives and public utility districts throughout the Columbia River Basin. As the hydroelectric sites on the Columbia River system have become exhausted, the pool of proprietary utilities is initiating a hydro-thermal generating system. A series of legislative and contractual recommendations designed to establish priorities for continuation of essential electric service are made. Strong recommendations are given for development of solar electric plants and nuclear power plants, based on fission reactors of contemporary design and the future technologies of breeder and fusion reactors. By the year 2075 the world's population will require 10 to 15 Q's of energy annually. A 'Q' is the equivalent of 2.9 kw hrs times 10 to the 14th power or 2.90 quadrillion kilowatt hours.
W75-06977

WATER USE AND COAL DEVELOPMENT IN EASTERN MONTANA: WATER AVAILABILITY AND DEMANDS,
Montana State Univ., Bozeman. Dept. of Economics and Agricultural Economics.
For primary bibliographic entry see Field 6D.
W75-06979

OWNERSHIP AND USE RIGHTS IN WATER WITHIN NORTH DAKOTA,
North Dakota Univ., Grand Forks. School of Law.
R. E. Beck.
Research Report No. WI-221-025-74, November, 1974, 3 p. OWRT A-035-NDak (1).

Descriptors: *North Dakota, Legal aspects, Common law, *Equitable apportionment, Federal-state water rights conflicts, Judicial decisions, Overlying proprietor, Permits, *Public rights, Reservation doctrine, Riparian waters, Usufructuary rights, *Water law, Water permits, *Water rights, Prescriptive rights, Prior appropriation, Riparian rights, Legislation.

No significant planning for the conservation, preservation, and development of a state's water resource can take place without identifying and analyzing the law relating to five broad areas of ownership and use rights: private rights; public rights; federal rights; Indian rights; and international rights, including claims of other states. Essentially there are three categories of private rights in North Dakota: appropriation under North Dakota statutes, groundwater through application to beneficial use at least before 1955; and surface waters under the riparian doctrine while it still subsisted in North Dakota. In general, the public own the waters within North Dakota subject to appropriation under state statute for beneficial use. Indians water rights have not been quantified nor has their ultimate theoretical scope been defined. The federal government has at least three bases for claiming rights; as riparian owner, as permittee under the state system and as proprietor of a superior navigation easement. Basic constitutional law doctine and compacts control much of the international and interstate situation. Equitable apportionment must take place but has not with reference to North Dakota.
W75-06995

LEGAL ASPECTS OF WATER FOR COAL GASIFICATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
In: Proceedings of the Workshop on Research Needs Related to Water for Energy, Water Resources Center, University of Illinois at Urbana-Champaign, Research Report No. 93, p 82-92, November, 1974. 18 ref.

Descriptors: *Legal aspects, Easements, Eminent domain, Equity, *Federal-state water rights conflicts, Water permits, *Public rights, Riparian water, Usufructuary right, *Riparian rights, *Water law, Natural Flow Doctrine, Legislation, *Water allocation(Policy), Research and development, Common law, Regulation, Zoning, Supply contracts.
Identifiers: *Coal gasification, Riparian Doctrine, Appropriative Doctrine, Diffused Surface Water Doctrine.

Since water is a necessary aspect of the conversion processes, the acquisition of the legal right to the requisite water is a significant factor. Laws and regulations throughout the United States which apply to water rights, ownership and control of utilization are explored. Private water rights for both surface water and groundwater have been the principal method of allocating water among competing users. Although federal control extends over navigable waters and inter- and intra-state streams which affect those waters, state legislation is the primary source of control. Complexity and uncertainty of water rights develop from environmental quality constraints as well as the obscure Western 'reserved water rights' legislation. Private water rights can be categorized into the Riparian Doctrine, Appropriative Doctrine and Diffused Surface Water Doctrine. These doctrines are discussed in relation to coal gasification or liquefaction in operation. State water laws often contrain the quantity of water needed for coal gasification and liquefaction and may also impose constraints on water quality alteration. Federal acts to protect the environment may conflict with industrial water applications. Legal problems involve altering use of stored water to meet needs of energy conversion. (See also W75-07089) (Salzman-North Carolina)
W75-07092

RESEARCH NEEDS ON SOCIAL, POLITICAL AND INSTITUTIONAL ASPECTS OF COAL UTILIZATION,
Kentucky Univ., Lexington. Center for Developmental Change.
For primary bibliographic entry see Field 6D.
W75-07096

DEVELOPMENT OF JAMES BAY: THE ROLE OF ENVIRONMENTAL IMPACT ASSESSMENT IN DETERMINING THE LEGAL RIGHT TO AN INTERLOCUTORY INJUNCTION,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 6G.
W75-07175

NATURAL RESOURCES MANAGEMENT IN THE GREAT LAKES BASIN,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
J. A. Burkholder.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-73-11943, $7.00 in paper copy, $2.25 in microfiche. New York State Sea Grant Program, Great Lakes Management Problems Series, May 1973. 172 p, 3 fig, 44 ref.

Descriptors: *Great Lakes, Management, *Institutions, Social aspects, Political aspects, Economics, *International commissions, Systems

analysis, *Natural resources, *Canada, *United States.

Notwithstanding the 1972 Water Quality Agreement between the U.S. and Canada for the Great Lakes, each country's interest could be better served with a broader agreement, integrating bilateral concerns. A two-phase plan is devised. All new features agreed to by the two governments under the Water Quality Agreement would be extended to specifically encompass air quality, fishery, lake levels, and navigation, as well as water quality concerns. To this, new functions, responsibilities and concepts have been added. The use of 'international technical boards' would be continued with five single central Great Lakes boards--air and water quality board, fishery board, lake levels board, navigation board, and a research advisory board. Regional offices would be utilized--a central administration office in the first phase with addition of four Lake-Basin offices under the second. The basic roles of the IJC/Great Lakes arrangements would be that of coordination and oversight (surveillance and guidance) in five major task areas: (1) A Basin-wide policy guidance function, (2) development of a central Great Lakes Basin information system, (3) a comprehensive research advisory function, (4) a basin planning function, including development of a Basin-wide (international) framework plan, and (5) measures to facilitate implementation and review of joint programs. (Auen-Wisconsin)
W75-07344

THE CALIFORNIA STATE WATER PROJECT IN 1970.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6B.
W75-07347

INFORMATION FOR BUYERS AND OWNERS OF COASTAL PROPERTY IN NORTH CAROLINA.
North Carolina State Univ., Raleigh. Center for Marine and Coastal Studies.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10959, $3.25 in paper copy, $2.25 in microfiche. (1974). 4 p.

Descriptors: *North Carolina, *Coasts, *Urbanization, *Land use, Community development, Erosion, Inlets(Waterways), Soil types, Storms, Dunes, Vegetation, Permits, Boundaries(Property), Septic tanks, Zoning, Insurance, Building codes.
Identifiers: Real estate development.

This brochure describes areas of awareness for prospective purchasers of coastal property in North Carolina to avoid depreciation or loss of investment. (1) Do not build in areas subject to beach erosion; (2) Avoid sites susceptible to inlet migration, (3) Do not build or buy in locations subject to flooding and high winds. Other areas to be considered are suitable soil type for septic tank effluents, sand fill over marsh areas, and the protection of dunes and coexisting vegetation. Federal, state, and local permits are required for shore erosion control, dredging, filling, dune alteration, agricultural drainage, diking, various waste discharges, and sanitation. Purchasers of land adjacent to dredged canals should assure that the canals are designed for adequate flushing. Boundary descriptions should be verified by competent representatives, and proposed land use should be compatible with local zoning regulations. Compliance with special building provisions often in effect for areas subject to flooding and wind storm damage is required to obtain insurance. (Auen-Wisconsin)
W75-07350

6F. Nonstructural Alternatives

INTEGRATION OF HYDROLOGIC, ECONOMIC, ECOLOGIC, SOCIAL, AND WELL-BEING FACTORS IN PLANNING FLOOD CONTROL MEASURES FOR URBAN STREAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James, A. C. Benke, and H. L. Ragsdale.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 385, $7.25 in paper copy, $2.25 in microfiche. Report No. ERC-0375, February 1975. 203 p, 23 fig, 58 tab, 93 ref, 3 append. OWRT B-082-GA(1). 14-31-0001-4070.

Descriptors: *Non-structural alternatives, Flood control, *Flood plain zoning, *Floodproofing, Urban hydrology, Urban sociology, Urbanization, *Social aspects, *Vegetation, Ecosystems, Land management, *Project planning, Parks, Aesthetics, *Georgia, City planning, *Channel improvement.

A well-planned flood control program requires coordinated implementation of a number of structural and nonstructural measures selected through the evaluation of a variety of hydrologic, economic, ecologic, social preference, and community well-being information. This study employed regional hydrologic analysis, a computer program for maximizing net benefits, field surveys of the flood plain environment, a questionnaire to learn the perceptions and the preferences of the concerned public, and an analysis of the relationship between flood plain land use and the well-being of the community and integrated all five types of information into the formulation of flood control programs for four small urban watersheds in Metropolitan Atlanta. The needed information of all five types is outlined in detail, and procedures for collecting and analyzing it are explained. The study strategy was to present the framework of information needs and procedures for collection and analysis to a class of graduate students containing several experienced planners, select four case study flood plains, divide the class into five teams (one for each information category), have the students collect the data, and formulate a course of action through group discussion. Plans combining channelization, flood proofing existing homes and businesses, building codes to require flood proofing of new construction, land use restrictions on new flood plain development, and preservation of identified valuable ecological areas are proposed. A 17-step procedure for use in formulating flood control programs for urban or urbanizing areas is outlined.
W75-06980

FLOOD PLAIN INFORMATION: AGUA HEDIONDA CREEK, PACIFIC OCEAN TO BUENA, SAN DIEGO COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-07087

FLOOD HAZARD ANALYSIS: FOUR MILE AND EIGHT MILE CREEKS, BUTLER COUNTY, KANSAS.
Soil Conservation Service, Salina, Kans.
For primary bibliographic entry see Field 4A.
W75-07088

TYPE 16 FLOOD INSURANCE STUDY: TSUNAMI PREDICTIONS FOR PACIFIC COASTAL COMMUNITIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
A. W. Garcia, and J. R. Houston.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-785 533, $5.75 in paper copy, $2.25 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report H-74-3, May 1974. 128 p, 79 fig, 1 tab, 35 ref, append.

Descriptors: *Flood forecasting, *Tsunamis, Coasts, *California, *Alaska, Insurance, Seismic design, Ocean waves, Forecasting, Tidal effects, Non-structural alternatives, Pacific coast region.
Identifiers: *Wave runup, *Flood insurance(Coasts).

Calculations of runup due to seismic sea waves (tsunamis) of distant origin are made for 15 coastal communities within the State of California and 3 coastal communities within the State of Alaska. The values given are interpreted as being equaled or exceeded on the average of once per 100 or once per 500 years, whichever is indicated. The combined effects of astronomical tides and tsunamis are incorporated into the analysis as well as local resonance effects where judged significant. The methodology is discussed. Analysis of the error attributed to each of the various steps in the procedure results in an estimated maximum average error of about plus or minus 40 percent for the southern California communities and plus or minus 75 percent for the Alaskan communities. It is essential that these runup predictions be reviewed approximately every five years in the light of advancements in the theory of tsunami generation, propagation, and runup. Significant future developments should be incorporated into the predictions performed and flood insurance rates adjusted accordingly. (WES)
W75-07283

GILA RIVER BASIN, NEW RIVER AND PHOENIX CITY STREAMS, ARIZONA: ALTERNATIVE PLANS FOR FLOOD CONTROL AND RECREATIONAL DEVELOPMENT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-07331

6G. Ecologic Impact Of Water Development

ECONOMIC CRITERIA FOR FRESHWATER WETLAND POLICY IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6B.
W75-06896

THE NEED FOR A COMPREHENSIVE APPROACH IN THE MANAGEMENT OF ENVIRONMENTAL RESOURCES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
D. S. Airan.
Water Resources Bulletin, Vol 9, No 3, p 421-432, June 1973. 6 fig, 1 tab, 31 ref.

Descriptors: *Comprehensive planning, *Management, Environment, Resources, *Pollution abatement, *Water quality control, Constraints, Air, Land resources, Limiting factors, Ecology, Feasibility, Waste disposal, Groundwater, Sewage, Solid wastes, Pesticides, Surface waters, Oceans, Decision making, Rivers.
Identifiers: Environmental quality, *Environmental impact, Radioactive wastes, Human wastes.

Environmental resources can be managed properly only by adopting a comprehensive approach. The whole environment must be considered as a single system, and prior to any action, all types of environmental impacts caused by it should be studied in detail. The close relationship between different environmental problems is emphasized; existing management patterns are analyzed; and new alternatives whenever applicable are proposed. Water resources is sub-divided

into ground, surface and sea water. Considered are: groundwater pollution; finding a quality parameter better than BOD; flushing of human waste in municipal sewers; sewer overloading by ground garbage; water quality management in rivers; and pollution in, and radioactive waste disposal into, the sea. Air pollution due to different processes is discussed, and problems in the management of land resources are considered, including disposal of solid wastes and the use of pesticides. The different constraints which must be considered in the decision-making process while developing a plan are discussed. Efforts neglecting the interaction among different aspects of the environment do not upgrade the quality of water, air, and land to any appreciable degree. Since it is impossible to satisfy all constraints in any system, a plan must be an optimal compromise consisting of those feasible alternatives which allow attainment of the maximum objectives with the minimum expenditure of resources. Limiting factors in environmental resource management include: economical, environmental, political, social, engineering/technical feasibility, resources, and needs. (Bell-Cornell)
W75-06938

HENDRICKSON V. WILSON (ACTION TO ENJOIN HARBOR EXPANSION PENDING IMPACT STATEMENT).
For primary bibliographic entry see Field 6E.
W75-06963

CALVERT CLIFFS COORDINATING COMMITTEE, INC., ET AL. V. UNITED STATES ATOMIC ENERGY COMM'N., ET AL. (ENFORCEMENT OF THE NATIONAL ENVIRONMENTAL POLICY ACT).
1 Pollution Control Guide (Vol. 3), paragraph 15004, p 15046-15062, 1973.

Descriptors: *Environmental effects, *Judicial decisions, *Administrative decisions, *Federal government, *Federal Water Pollution Control Act, Radioactivity effects, Legal aspects, Legal review, Water law, Permits, Regulation, Administration, Administrative agencies, Federal project policy, Evaluation, Decision making, Legislation, Nuclear powerplants, Inter-agency cooperation, Adjudication procedure.
Identifiers: Administrative regulations, *National Environmental Policy Act, Citizen suits, Licenses, Environmental policy.

The petitioners, an environmental group, brought action in the United States Court of Appeals for the District of Columbia, seeking review of an order of the Atomic Energy Commission (AEC). The petitioners argued that certain rules recently adopted by the Commission to govern consideration of environmental factors through its review processes failed to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969. Specifically challenged were rules relating to the consideration of environmental factors by hearing boards, implementation of the NEPA review standards, and application of environmental standards to projects approved before the NEPA standards took effect. The Commission contended that the vagueness of the NEPA mandate left much room for agency discretion and that the challenged rules fell well within the broad language of the Act. The court ruled that while the Act granted discretionary powers concerning substantive matters, the procedural directives of the Act were specific and had not been followed by the Commission. The court ordered the AEC rules revised in accordance with the NEPA requirement that environmental factors be considered to the fullest extent possible, and that environmental issues be considered at every stage where a balancing of environmental and nonenvironmental factors is appropriate. (Deckert-Florida)
W75-06972

ENVIRONMENTAL CONSIDERATIONS FOR CONSTRUCTION PROJECTS.
Agency for International Development, Washington, D.C. Office of Science and Technology.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-203 326, $3.75 in paper copy, $2.25 in microfiche. Report TA/OST/71-1, July 1971. 31 p, 55 ref.

Descriptors: *Construction, *Environmental effects, Road construction, Harbors, Airports, Irrigation systems, Dam construction, Powerplants, Industries, Mining, Mineral industry, Pulp and paper industry, Fertilizers, Sewage treatment.

Environmental considerations for twelve categories of construction projects were presented in the form of key questions designed to serve as general points of departure for analyzing the potential environmental consequences of proposed projects. Projects discussed were: road construction, port and harbor development, airports, irrigation systems, dam construction, power plants, petroleum-petrochemical industry, mining, smelting, pulp and paper industry, fertilizer plants, and sewage treatment. (Sims-ISWS)
W75-07047

THE HANLON CREEK STUDY: AN ECOLOGICAL APPROACH TO URBAN PLANNING,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 6B.
W75-07067

COAL CONVERSION: PROCESSES, RESOURCE REQUIREMENTS, AND ENVIRONMENTAL IMPACT.
Illinois Univ., Urbana. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6D.
W75-07090

RESEARCH NEEDS RELATED TO THE ENVIRONMENTAL ASPECTS OF COAL GASIFICATION/LIQUEFACTION,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 6D.
W75-07099

SOCIAL AND ECONOMIC IMPACTS OF WASTE WATER MANAGEMENT IN THE MERRIMACK BASIN,
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5C.
W75-07121

WASTE WATER MANAGEMENT - A REGIONAL PROBLEM,
Corps of Engineers, New York. North Atlantic Div.
For primary bibliographic entry see Field 5C.
W75-07124

HANLON CREEK ECOLOGICAL STUDY, PHASE A,
Guelph Univ. (Ontario).
J. D. Milliken, R. J. Brooks, P. Chisholm, D. Elrick, and R. R. Forster.
Guelph University, Center for Resources Development, Ontario, Canada, Publication No. 50, September 1971. 66 p, 12 fig, 9 tab.

Descriptors: *Ecology, *Land use, *Urban sociology, *On-site data collections, *Watersheds(Basins), Water, Quality control, Drainage patterns(Geologic), Runoff, Canada, Environmental control, Storage, Aquatic environment.
Identifiers: Runoff retention ponds, Guelph, Ontario(Canada).

The existing micro-drainage system of the Hanlon Expressway Corridor in the vicinity of Hanlon Creek at Guelph, Ontario was identified and analyzed in relationship to the effect of proposed expressway works. The highway as proposed may interfere with sub-surface drainage in some locations resulting in ponding and high water tables. Rerouting of surface drainage in some areas as proposed may be expected to result in soil erosion during construction particularly and an increase in the sediment load reaching the stream. An increase in levels of sodium and chloride in the water of the Hanlon Creek may be expected from de-icing salts used on the Expressway. Existing high nitrate levels if supported by relatively small increases in phosphate will induce heavy algal blooms. Deforestation either directly associated with construction or resulting from changes in water tables and exposure will increase solar heating of the stream and threaten desirable aquatic species. The plans should consider erosion control, storm runoff retention ponds, minimum destruction of existing vegetation, and maintenance of all environmental protection measures. Monitoring systems should be established and further research should be initiated. (See also W75-07128) (Poertner)
W75-07127

HANLON CREEK ECOLOGICAL STUDY, PHASE B, VOL. 1,
Guelph Univ. (Ontario).
J. D. Milliken, R. J. Brooks, E. A. Cebotarev, P. Chisholm, and E. E. Mackintosh.
Guelph University, Center for Resources Development, Ontario, Canada, Publication No. 51, April 1972. 71 p, 13 fig, 1 tab.

Descriptors: *Urbanization, *Urban sociology, *Land use, *Ecology, *On-site data collections, *Social aspects, Aesthetics, Recreation facilities, Recreation demand, Soil management, Alternative planning, Conservation, Canada, Ecological distribution, Physiological ecology, Plant ecology, Water quality control.
Identifiers: Guelph, Ontario(Canada), Hanlon Creek Watershed.

The Hanlon Creek watershed in the City of Guelph, Ontario was studied in concert with the projected environmental impact of a multiplicity of urban land uses. A substantial volume of base data is given which depicts the present terrestrial and aquatic environment of the Hanlon Creek and its watershed. These data have provided the basis for projecting and testing development opportunities and constraints. In addition, this inventory is sufficiently comprehensive to establish a base plane for measurement of change as urbanization takes place in the vicinity. Recommendations are made concerning municipal development and change, stream biology considerations, terrestrial wildlife and vegetation, landscape quality control, and social concerns. Data and discussions are included on soil and water resources, biological conditions in Hanlon Creek, terrestrial wildlife and vegetation, landscape esthetics and sociological aspects. The study guidelines included development policies which identified several alternative boundaries for lands deemed undesirable for urban development, yet desirable for conservation or 'greenbelt' purposes. These alternative policies are studied with the emphasis on conservation, recreation, development, and servicing capability. (See also W75-07127) (Poertner)
W75-07128

REGIONAL SERVICES PROGRAM, FISCAL YEAR 1974-75,
Bay Area Sewage Services Agency, Berkeley, Calif.
For primary bibliographic entry see Field 5G.
W75-07133

IMPACT ANALYSIS: HINDSIGHT AND FORESIGHT IN SASKATCHEWAN,
Saskatchewan Fisheries Lab., Saskatoon.

F. M. Atton.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 101-105, January 1975. 2 fig, 2 tab.

Descriptors: *Hydroelectric project licensing, *Reservoirs, *Environment, *Environmental effects, Shoreline cover, Shore protection, Terrain analysis, Erosion rates, Sedimentation, Pakolimnology, Limnology, *Canada, Ecology, Water quality, Fisheries.
Identifiers: *Saskatchewan(Canada).

Three hydro-developments in Saskatchewan were described. A fourth reservoir proposal is under study and is to be reviewed for a decision in 1975. This appears to be the first project where impact analysis is being carried out before implementation is decided upon. A brief resume of information on these impoundments includes limnology, aquatic ecology, and water quality. This enabled broad description of the impact of impoundment and inundation rather than consideration of the fishery resource only. Particular attention was given to the need for shoreline mapping, terrain description, forest clearing, erosion prediction, permafrost discovery, and mitigation of effects on fishery resources. The discussion emphasized the practical approach. (Dawes-ISWS)
W75-07171

HYDROELECTRIC DEVELOPMENT OF THE NELSON RIVER SYSTEM IN NORTHERN MANITOBA,
Manitoba Hydro, Winnipeg.
I. W. Dickson.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 106-116, January 1975. 3 fig.

Descriptors: *Hydroelectric project licensing, *Ecology, *Environment, *Environmental effects, Shoreline cover, Terrain analysis, Erosion rates, Sedimentation, Paleolimnology, Limnology, Economic impact, Social impact, Social values, Social adjustment, Flow, Recreation, Wildlife, *Canada, Aesthetics, Earth-water interfaces.
Identifiers: *Nelson River System(Manitoba).

Manitoba Hydro plans to divert the Churchill River at Southern Indian Lake to the Nelson River via the Rat-Burntwood Rivers. Combined flows of the Churchill and Nelson Rivers would generate more than 7 mil kw at 14 power generating sites along the Nelson River system. Regulation of Lake Winnipeg is required to provide storage to augment flows in the Nelson River. Impacts to beaches, marshes, recreation, and wildlife are important aspects of Lake Winnipeg regulation. The level and flow pattern of Outlet Lakes at Lake Winnipeg will also be altered by regulation. Life styles and cultural values of residents in the Cross Lake community may be affected by the project. Diversion of 30,000 cfs from the Churchill to the Nelson River may reduce flows which have historically ranged from 20,500 to 92,000 cfs to minimum winter and summer flows of 1500 and 500 cfs, respectively. Altered levels, flows, and associated ice regime may be expected to significantly alter the aesthetic qualities of the river. Raising Southern Indian Lake level may cause major changes to the appearance of the landscape and the use of associated resources. Storage and release of waters from impoundments along the Rat-Burntwood diversion route will significantly alter the characteristics of the land-water interface. Flows increased from 4000 to 34,000 cfs and flooding will have a major impact on availability and use of associated resources. Notigi Lake control for Churchill River diversion will cause flooding of about 40,500 hectares. Additional flooding of approximately the same area below the Notigi Control can be anticipated following diversion and the development of Wuskwatim and Manasan sites on the Burntwood River. (Dawes-ISWS)
W75-07172

ENVIRONMENTAL IMPACT OF THE CHURCHILL FALLS (LABRADOR) HYDROELECTRIC PROJECT: A PRELIMINARY ASSESSMENT,
Waterloo Univ. (Ontario). Dept. of Biology.
H. C. Duthie, and M. L. Ostrofsky.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 117-125, January 1975. 4 fig, 3 tab, 6 ref.

Descriptors: *Hydroelectric project licensing, *Ecology, *Environment, *Environmental effects, Shoreline cover, Shore protection, Terrain analysis, Erosion rates, Sedimentation, Pakolimnology, Limnology, Chemical properties, Ecological distribution, *Canada, Flooding, Water chemistry, Planning, Biomass.
Identifiers: *Labrador(Churchill Falls).

The Churchill Falls hydroelectric project in western Labrador involved the creation of reservoirs totalling 6650 sq km in area and the diversion of two rivers: the Churchill and the Naskaupi. A considerable area of forest and muskeg was inundated. Flooding began in 1971 and full pond was expected in 1974. The nominal installed capacity of the scheme is 5.23 million kw, most of which will be transmitted via three 735-kv lines to the Hydro Quebec grid. The entire project will be completed by 1975. The original feasibility studies for the project concentrated on a cataloging of fish and wildlife. Downstream effects of flow regulation were considered. Before hydroelectric development, the area was practically uninhabited and was given very little economic attention. A unique feature of ecological importance affected by the scheme is the vegetation of the spray zone around the falls. A study of the effect on this vegetation of closing the falls is in progress. A study of the impact of flooding on water quality and biology was begun before damming and will be continued indefinitely after impoundment. Preliminary findings show little evidence for humification or oxygen deficiency even in newly flooded areas, but conductivity and many dissolved ions have increased. Populations of both phytoplankton and zooplankton have generally increased and changed qualitatively with impoundment, particularly in shallow water. The primary productivity of the phytoplankton has increased significantly in flooded areas. The ecological impact on the Naskaupi River of the loss of its headwaters is being investigated. Other ongoing ecological studies at Churchill Falls include investigations on fisheries, wildlife, and forests. (Dawes-ISWS)
W75-07173

ECOLOGICAL CONSEQUENCES OF THE PROPOSED MORAN DAM ON THE FRASER RIVER,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
G. H. Geen.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 126-135, January 1975. 1 fig, 20 ref.

Descriptors: *Dams, *Environmental effects, *Salmon, *Rivers, Fish barriers, Fish handling facilities, Fish ladders, Commercial fishing, Anadromous fish, Reservoirs, Lakes, Ecology, Hydroelectric plants. Damsites, Effects, Migration patterns, Fish migration, Fish behavior, *Canada.
Identifiers: Ecological effects, *Fraser River(Canada).

The details of a high-head dam often proposed for the Fraser River were presented. The anticipated effects of such a development were considered. Changes in temperature, flow, and turbidity regimes would likely reduce the growth or survival of young salmon in both the lower river and the Strait of Georgia. Nitrogen supersaturation would affect both adults and young salmonids for a considerable distance below the dam. Satisfactory and economical methods for transporting large numbers of adult salmon upstream over a dam without undue delay have not been developed. Further, no dependable system is available for trapping young downstream migrants in the reservoir. Losses of young through residualism and predation in the reservoir and spillway or turbine mortality would be high. Viable alternatives to natural production that would ensure the maintenance of upstream stocks of salmonids such as sockeye and chinook salmon do not presently exist. It was concluded that a high-head dam on the main stem Fraser River would result in the elimination of upstream stocks and contribute to a decline in some downstream stocks. (Sims-ISWS)
W75-07174

DEVELOPMENT OF JAMES BAY: THE ROLE OF ENVIRONMENTAL IMPACT ASSESSMENT IN DETERMINING THE LEGAL RIGHT TO AN INTERLOCUTORY INJUNCTION,
McGill Univ., Montreal (Quebec). Dept. of Geography.
A. F. Penn.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 136-160, January 1975. 1 fig, 11 ref, 1 append.

Descriptors: *Legal aspects, *Environmental effects, *Projects, Dams, Hydrology, Vegetation, Fisheries, Ecology, Legal review, Wildlife, Animal populations, Beavers, *Canada.
Identifiers: Interlocutory injunction, *Impact assessments, Indian rights, *James Bay(Canada), James Bay Development Corporation.

The interlocutory injunction sought by Indians in the James Bay Territory to halt development by the James Bay Development Corporation was examined, especially the legal requirement that the Petitioners demonstrate 'serious or irreparable injury' arising from the project, and that they are and will continue to be adversely affected by the project. Demonstration of injury and adverse effects required carefully argued environmental impact assessment. These impact assessments relate chiefly to changes in hydrology, vegetation, fisheries, and mammalian ecology and, in that the assessments constitute important evidence for determining rights to the continued enjoyment of the resources of a region, their significance extends beyond the immediate claim for recognition of Indian title to land. As long as criteria do not exist for establishing the content of impact assessment or for determining the action to be taken on the basis of such assessment, it was considered unrealistic to require an overall impact assessment that could withstand careful scrutiny of both the general public and of environmental scientists. It appeared more reasonable to require a developer to identify specific environmental problems that are likely to arise from conflicting uses of the natural resources of a region. The research should be commissioned and the conclusions should be submitted, with engineering plans, for approval to a specially designated authority. Such procedure is necessary to avoid costly and time-consuming court hearings. (Sims-ISWS)
W75-07175

ECOLOGICAL CHANGES DUE TO HYDROELECTRIC DEVELOPMENT ON THE SAINT JOHN RIVER,
Fisheries and Marine Service, Halifax (Nova Scotia). Resource Development Branch.
C. P. Ruggles, and W. D. Watt.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 161-170, January 1975. 2 fig, 2 tab, 15 ref.

Descriptors: Dams, *Hydroelectric plants, *Environmental effects, *Water pollution, Pollutants, Rivers, Reservoirs, Commercial fishing, Sport fishing, Fish passages, Salmon, Anadromous fish, DDT, Biochemical oxygen demand, Water quality, Ecology, Aquatic life,

Nitrogen, Supersaturation, Sludge worms, Bloodworms, *Canada.
Identifiers: *Saint John River(Canada).

Most of the available head of the Saint John River is utilized for hydroelectric development by a series of dams located from the headwaters almost to tidewater. Seven of these hydroelectric dams were described in terms of location, power generation, size of impoundment, operating schedule, and fish passage facilities. Access to upstream spawning areas by Atlantic salmon (Salmo salar) and other anadromous species has been impeded, while ecological changes in the impoundments have favored such species as the alewife (Alosa pseudoharengus) and the white sucker (Catostomus commersoni). Hydroelectric developments on the main stem of the river have reduced the capacity of the river to assimilate organic wastes and have resulted in a reduction of dissolved oxygen content. Fish kills have occurred due to low dissolved oxygen in the headponds and to supersaturation of nitrogen below the lowermost dam. The combination of impoundments and high pollution load results in the heterotrophic food chain dominating the biological carbon flow. (Sims-ISWS)
W75-07176

IMPACT OF THE BENNETT DAM ON THE PEACE-ATHABASCA DELTA,
Canadian Wildlife Service, Edmonton (Alberta).
G. H. Townsend.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 171-176, January 1975.

Descriptors: Dams, *Environmental effects, *Wetlands, *Habitats, Wildlife habitats, Wildlife, Marshes, Aquatic habitats, Ecology, Soil-water-plant relationships, Marsh plants, Plant morphology, Fish, Waterfowl, Spawning, Weirs, *Canada.
Identifiers: Perched basins, *Peace-Athabasca delta(Canada).

The Peace-Athabasca Delta Project was an intergovernmental study group assembled to assess possible downstream effects of the W.A.C. Bennett Dam on the Peace-Athabasca delta and Lake Athabasca. Low water levels on the delta coincided with the upstream filling of the Williston Reservoir during 1968-1970, exposing thousands of acres of marsh and lake bottom, advancing plant succession (toward the less desirable willow communities), threatening access of migrating fish to the delta's spawning lakes, and reducing nesting habitat for waterfowl and overwinter habitat for muskrats. The resultant drastic decline in the muskrat population affected the economy of Fort Chipewyan and the lifestyle of its native people because of their dependency on trapping. The long-term effects of the changed regime were predicted to decrease important shoreline of perched basins by approximately 50%, to cause plant succession to proceed uninterrupted for longer periods of time, thereby accelerating the ageing of the delta, to shift plant zones to lower elevations around lake margins, and to reduce the vertical ranges and area of early successional plant communities by as much as 50%. Waterfowl production is expected to decline by 20-25%, and muskrat populations will decrease by 40-65%. Bison grazing meadows will suffer losses although moose habitat is expected to improve. A number of remedial alternatives were examined to seek a solution to restoration of water levels. A fixed-crest weir on an outlet channel of Lake Athabasca was selected to satisfactorily restore the natural regime. (Sims-ISWS)
W75-07177

ASSESSMENT OF THE IMPACT OF HYDRO-DAMS,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
I. E. Efford.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 196-209, January 1975. 2 ref, 1 append.

Descriptors: Dams, *Hydroelectric plants, *Hydroelectric project licensing, *Environmental effects, Political aspects, Planning, Project planning, Damsites, Dam design, Pipelines, Decision making, *Canada.
Identifiers: *Environmental impact statement, Case studies.

At present, assessments of the impact of a dam are becoming part of the design process but they are still not completed early enough to affect the overall decision to construct a particular dam at a particular site. Thus, their real value is lost because attempts to correct social and environmental problems are made after rather than before the problem has arisen. Impact statements at the moment assess only alternatives to the design of a dam. They ought to include analyses of alternative uses of the valley, the long-term value of delaying the decision, the relative merits of generating power by other means, and finally the merits of reducing energy demands by rationing or raising prices. The assessment of impact should be considered a positive contribution to helping the decision-maker rather than an annoying complication preventing him from getting on with his job. In today's increasingly complex world we must proceed more cautiously because the synergistic interactions, resulting from major undertakings like dams, pipelines, etc., are many and frequently not obvious. Public access to impact assessments is an essential aspect of the democratic process and will help to anticipate some of these problems. An appendix lists 80 large dams having capacities of more than 100 MW as well as various characteristics of the projects. (Sims-ISWS)
W75-07178

KONA DAM VS. KONATOWN: A SOCIOLOGICAL INTERPRETATION OF SELECTED IMPACTS OF RESERVOIR DEVELOPMENT ON A COMMUNITY FIELD,
East Texas State Univ., Commerce. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W75-07271

COMPUTER-CALCULATED GEOMETRIC CHARACTERISTICS OF MIDDLE-MISSISSIPPI RIVER SIDE CHANNELS; VOLUME 1: PROCEDURES AND RESULTS; VOLUME 2: SIDE CHANNEL CONTOUR MAPS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-07282

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION; REPORT 1, SCOPE OF STUDY AND REVIEW OF AVAILABLE DATA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2H.
W75-07286

ENVIRONMENTAL INVENTORY AND ASSESSMENT, ILLINOIS WATERWAY; 12-FOOT CHANNEL NAVIGATION PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-07288

MATHEMATICAL MODEL STUDY OF A FLOW CONTROL PLAN FOR THE CHESAPEAKE AND DELAWARE CANAL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-07289

AMCHITKA BIOENVIRONMENTAL PROGRAM: FRESHWATER VERTEBRATE AND INVERTEBRATE ECOLOGY OF AMCHITKA ISLAND, ALASKA. FINAL SUMMARY REPORT AND PROGRESS REPORT,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5C.
W75-07338

7. RESOURCES DATA

7A. Network Design

HISTORY OF HYDROLOGY--A BRIEF SUMMARY,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 2A.
W75-07227

HYDROLOGIC UNIT MAP--1974, STATE OF WEST VIRGINIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07234

HYDROLOGIC UNIT MAP--1974, STATE OF INDIANA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07235

HYDROLOGIC UNIT MAP--1974, STATE OF PENNSYLVANIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07236

HYDROLOGIC UNIT MAP--1974, STATE OF OHIO.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-07237

7B. Data Acquisition

AN INSTRUMENT SYSTEM FOR ESTIMATION OF EVAPOTRANSPIRATION BY THE EDDY CORRELATION METHOD,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife, and Range Sciences.
For primary bibliographic entry see Field 2D.
W75-06894

DEVELOPMENT OF MICRO-SCALE LABORATORY FILTRATION TECHNIQUES,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-06990

ESTIMATION OF SEA SURFACE TEMPERATURE FROM REMOTE SENSING IN THE 11- TO 13-MICROMETER WINDOW REGION,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
C. Prabhakara, G. Dalu, and V. G. Kunde.
Journal of Geophysical Research, Vol 79, No 33, p 5039-5044, November 20, 1974. 5 fig, 4 tab, 26 ref.

Descriptors: *Remote sensing, *Satellites(Artificial), *Temperature, *Oceans, Estimating, Data collections, Radiation, Humidity, Measurement, Water vapor, Absorption, Sea water.

The Nimbus 3 and 4 Iris spectral data in the 11- to 13-micrometer water vapor window region were analyzed to determine the sea surface temperature (SST). The high spectral resolution data of Iris were averaged over approximately 1-micrometer-wide intervals to simulate channels of a radiometer to measure the SST. Three such channels in the 775- to 960-cm (12.9-10.5 micrometer) region were utilized to measure the SST over cloud-free oceans. However, two of these channels were sufficient in routine SST determination. The differential absorption properties of water vapor in the two channels enabled the determination of the water vapor absorption correction without detailed knowledge of the vertical profiles of temperature and water vapor. The feasibility of determining the SST was demonstrated globally with Nimbus 3 data, where cloud-free areas can be selected with the help of albedo data from the medium-resolution infrared radiometer experiment on board the same satellite. The SST derived from this technique agrees with the measurements made by ships to about 1C. (Sims-ISWS)
W75-07043

DOPPLER RADAR OBSERVATIONS OF A HAILSTORM,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
For primary bibliographic entry see Field 2B.
W75-07049

EXPERIMENTAL RESULTS WITH A RAIN ANALYZER,
Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
For primary bibliographic entry see Field 2B.
W75-07050

THE ELECTRICAL ANISOTROPY OF SEA ICE IN THE HORIZONTAL PLANE,
Geophysical Survey Systems, Inc., North Billerica, Mass.
For primary bibliographic entry see Field 2C.
W75-07055

HAIL AND RAINDROP SIZE DISTRIBUTIONS FROM A SWISS MULTICELL STORM,
Eidgenoessische Technische Hochschule, Zuerich (Switzerland).
For primary bibliographic entry see Field 2B.
W75-07056

STATIONARITY OF MESOSCALE AIRFLOW IN MOUNTAINOUS TERRAIN,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 2B.
W75-07061

THE DEPENDENCE OF BARE SOIL ALBEDO ON SOIL WATER CONTENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W75-07062

CUMULATIVE CHEMICAL LIGHT METER,
Westinghouse Research Labs., Pittsburgh, Pa.
For primary bibliographic entry see Field 5A.
W75-07063

INSTRUMENTS FOR WATER QUALITY MEASUREMENTS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 5A.
W75-07065

INFLUENCE OF SAMPLE DISTURBANCE AND TEST METHOD ON KEY ENGINEERING PROPERTIES OF MARINE SOILS,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W75-07074

JUMBO TORNADO OUTBREAK OF 3 APRIL 1974,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2B.
W75-07082

TIDAL AND DIURNAL EFFECTS ON ZOOPLANKTON SAMPLE VARIABILITY IN A NEARSHORE MARINE ENVIRONMENT,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 2L.
W75-07179

A TEST OF AN EXPERIMENTAL POLAR-ORBITING SATELLITE SYSTEM FOR RELAYING HYDROLOGICAL DATA,
Geological Survey, Reston, Va.
R. W. Paulson.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 23-28, 1974. 4 fig, 6 ref.

Descriptors: *Data collections, *Data transmission, *Telemetry, *Satellites(Artificial), Hydrologic data, Water wells, Floods, Water levels, Water quality, Gaging stations, Monitoring.
Identifiers: *ERTS.

The U.S. Geological Survey is testing an experimental polar-orbiting satellite communications system that relays hydrological data from remote ground-based radios to central data-reception sites. Hydrological stations at several test sites across the United States were instrumented with small battery-operated radios that transmit data several times daily to the Earth Resources Technology Satellite (ERTS), which re-broadcasts the data to central data-reception sites. The most commonly transmitted hydrological variable is rever stage, but rainfall, snow depth, groundwater level, and a wide variety of water quality parameters are also transmitted. Although the availability of data from a hydrological station is presently restricted to 3-6 opportunities per day with the experimental ERTS satellite, a system of several polar-orbiting satellites is technically feasible and satellite-relayed data could be made available in a timely fashion for monitoring hydrological conditions and for flood warning. The Data Collection System is being tested by the Geological Survey in cooperation with the Earth Resources Observation System (EROS) program of the U.S. Department of the Interior, the National Aeronautics and Space Administration (NASA), and numerous water resources management agencies. (Knapp-USGS)
W75-07201

URBAN STORM RAINFALL-RUNOFF-QUALITY INSTRUMENTATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W75-07202

ERTS IMAGERY FOR GROUND-WATER INVESTIGATIONS,
Geological Survey, Bay Saint Louis, Miss. Gulf Coast Hydroscience Center.
G. K. Moore, and M. Deutsch.
Ground Water, Vol 13, No 2, p 214-226, March-April 1975. 6 fig, 12 ref.

Descriptors: *Remote sensing, *Water resources, *Mapping, *Satellites(Artificial), *Groundwater, Hydrogeology, Investigations, Exploration, Surveys, Terrain analysis.
Identifiers: *ERTS.

ERTS imagery offers an opportunity to apply moderately high-resolution satellite data to the nationwide study of water resources. This imagery is both a tool and a form of basic data. The main advantage of its use is to reduce the need for field work. In addition, broad regional features may be seen easily on ERTS imagery, whereas they would be difficult or impossible to see on the ground or on low-altitude aerial photographs. Some present and potential uses of ERTS imagery are to locate new aquifers, to study aquifer recharge and discharge, to estimate groundwater pumpage for irrigation, to predict the location and type of aquifer management problems, and to locate and monitor strip mines which commonly are sources for acid mine drainage. In many cases, boundaries which are gradational on the ground appear to be sharp on ERTS imagery. Initial results indicate that the accuracy of maps produced from ERTS imagery is adequate for many purposes. (Knapp-USGS)
W75-07208

A SIMPLE SYSTEM FOR FREEZE DRYING,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
B. M. Kilcullen, and R. D. Harter.
Journal of Chemical Education, Vol 51, p 590, September 1974. 1 fig. OWRT A-020-NH(11).

Descriptors: *Freeze drying, *Laboratory equipment, *Drying, Equipment, Laboratories, Design, Waste water treatment, Water treatment.

A simple system to freeze dry small quantities of material was described. The apparatus is similar to the series of vacuum traps routinely used for vacuum distillation. Most of the equipment should be readily available in the laboratory. The system was constructed so that simultaneous freeze drying of two samples is possible. However, the design is readily adaptable to available equipment. Standard separable vacuum traps are used throughout. (Sims-ISWS)
W75-07245

A COMPARISON OF VERTICAL DRIFT-ENVELOPES TO CONVENTIONAL DRIFT-BOTTLES,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
For primary bibliographic entry see Field 2L.
W75-07248

OPTICAL LEVITATION OF LIQUID DROPS BY RADIATION PRESSURE,
Bell Labs., Holmdel, N.J.
For primary bibliographic entry see Field 2B.
W75-07269

7C. Evaluation, Processing and Publication

PUERTO RICO WATER RESOURCES PLANNING MODEL PROGRAM DESCRIPTION,
Geological Survey, Reston, Va.
D. W. Moody, T. Maddock, III, M. R. Karlinger, and J. J. Lloyd.
Geological Survey open-file report, June 1973. 126 p, 3 fig, 3 tab, 9 ref, 5 append.

Descriptors: *Planning, *Mathematical models, *Puerto Rico, *Computer programs, Data processing, Systems analysis, Water resources development.

The Model Definition and Control Program (MODCOP) is intended to assist a planner in preparing input data for the Puerto Rico Water Resources Planning Model. The model utilizes a mixed-integer mathematical program to identify a minimum present cost set of water resources projects (diversions, reservoirs, groundwater fields, desalinization plants, water treatment plants, and interbasin transfers of water) which will meet a set of future water demands and to determine their sequence of construction. While MODCOP was specifically written to generate input data for the planning model (described in this report), the program can be easily modified to reflect changes in the model's mathematical structure. (Knapp-USGS)
W75-06934

A SUMMARY VIEW OF WATER SUPPLY AND DEMAND IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 6D.
W75-06935

MEAN ANNUAL RUNOFF IN THE SAN FRANCISCO BAY REGION, CALIFORNIA, 1931-70,
Geological Survey, Menlo Park, Calif.
S. E. Rantz.
San Francisco Bay Region Environment and Resources Planning Study Basic Data Contribution 69 (Geological Survey Miscellaneous Field Studies Map MF-613), 1974. 24 p, 2 map, 3 tab, 2 ref.

Descriptors: *Runoff, *California, *Maps, Rainfall-runoff relationships, Data collections, Hydrologic data.
Identifiers: *San Francisco Bay region(Calif).

This map shows the areal distribution of mean annual runoff in the San Francisco Bay region, California. The report area includes the nine counties that are collectively referred to as the San Francisco Bay region, and adjacent area. The values of mean annual runoff shown on the map represent natural flow, or that part of the precipitation that would appear in water courses or stream channels where, or if, human activity had negligible effect on runoff. The 76 gaging-station records used in developing the runoff map were therefore, those for streams that are either virtually undeveloped or, if developed, have records whose annual discharges can be adjusted for such manmade effects as diversion, storage, and import of water. For consistency, mean annual runoff figures for all gaging stations were adjusted to cover a common 40-year time base, 1931-70; the dearth of long-term runoff records made it impractical to use a base period longer than 40 years. Mean annual precipitation for the period 1931-70 is virtually identical with the long-term mean annual precipitation, thereby confirming the representativeness of the 40-year study period. (Knapp-USGS)
W75-06936

CROSS-IMPACT SIMULATION IN WATER RESOURCE PLANNING,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6A.
W75-06940

SYSTEM 11 'SIVA', A DESIGN SYSTEM FOR RIVERS AND ESTUARIES,
Technische Hogeschool, Delft (Netherlands). International Courses in Hydraulics.
For primary bibliographic entry see Field 2E.
W75-07016

ANALOG, DIGITAL AND HYBRID SIMULATION OF WATER LEVEL DISTRIBUTION IN

OCCURRENCES OF FLOODS IN A SYSTEM RIVER FLOOD PLAIN,
Technische Universitaet, Hanover (West Germany). Institut fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
For primary bibliographic entry see Field 2E.
W75-07018

SOC73, A ONE-DIMENSIONAL WAVE PROPAGATION CODE FOR ROCK MEDIA,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8E.
W75-07041

AN ANALYSIS OF THE GROUND MOTION FROM RIO BLANCO,
California Univ., Livermore. Lawrence Livermore Lab.
L. S. Germain.
Report UCRL-51668, September 30, 1974. 16 p, 20 fig, 8 tab, 6 ref. AEC Contract W-7405-Eng-48.

Descriptors: *Colorado, *Seismic studies, *On-site data collections, Evaluation, Analysis, Seismology, Movement, Velocity, Seismic waves, Nuclear explosions, Underground.
Identifiers: *Rio Blanco project, *Ground motion.

Project Rio Blanco is a government-industry gas-reservoir stimulation experiment using three 30-kt (125-TJ) nuclear explosives detonated simultaneously in a single well bore, at depths of 1780, 1900, and 2040 m. The detonation occurred at approximately 10:00 a.m. Mountain Daylight Time on May 17, 1973. As a part of the project, 36 locations were instrumented for ground motion by the U.S. Geological Survey, Seismic Engineering Branch. Data resulting from these measurements were published by the Environmental Research Corporation. In particular, distance, bearing, and peak amplitudes for acceleration, velocity, and displacement were given for each station. These data, and similar data from the other gas stimulation experiments, Gasbuggy and Rulison, were subjected to further analysis. High-accuracy estimates of ground motion for such events is beyond the current state of the art and will remain so until an explanation for the 50% variation in station response can be found. (Humphreys-ISWS)
W75-07048

APPLICATION OF A CATCHMENT MODEL IN SOUTHEASTERN AUSTRAILIA,
Monash Univ., Clayton (Australia). Dept. of Civol Engineering.
For primary bibliographic entry see Field 2A.
W75-07054

SUMMARY AND ANALYSIS OF PHYSICAL OCEANOGRAPHY DATA COLLECTED IN THE NEW YORK BIGHT APEX DURING 1969-70,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 2L.
W75-07069

GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE, NO. 2, SUMMARY REPORT 1973.
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
December 1974, 110 p. John M. Miller, editor.

Descriptors: Measurement, *Gases, *Aerosols, *Meteorology, *Solar radiation, Carbon dioxide, Ozone, Instrumentation, Calibrations, Chemical precipitation, Data collections, Data storage and retrieval, *Monitoring, Geophysics, Climates.
Identifiers: *Observatory facilities, Mauna Loa, South Pole, Barrow(AK), Samoa, Freon-11, Aitken nuclei concentration, Data acquisition systems.

During 1973, there was a shift from the previous emphasis in the program objectives of the Geophysical Monitoring for Climatic Change from establishing observatories to developing uniform operating and reporting procedures. The amount of data has increased and this has led to the design of centralized data handling methods to cope with the information expected in 1974 and 1975. Major physical changes within the observatory network occurred with the completion of the total ozone observational dome at Point Barrow, preparatory design work for major additions to the South Pole program, and construction of a sampling tower at Samoa. Details of augmented programs are included such as measurement programs, flask sampling for freon and carbon tetrachloride, lidar system development, Aitken data collection, and solar radiation monitoring programs. The year saw staff assigned to 3 new observatories; acquisition and installation of new measurement programs; and establishment of initial support facilities and staff for data quality control and processing and for analyses. (NOAA)
W75-07076

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS FOR GREAT LAKES AREAS: VOLUME 2, LAKE HURON AND GEORGIAN BAY.
National Climatic Center, Asheville, N.C.
For primary bibliographic entry see Field 2B.
W75-07079

MANUALLY DIGITIZED RADAR GRIDS: A COMPARISON OF RESOLUTION CAPABILITIES FOR A HEAVY RAINFALL SITUATION,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W75-07081

FLOOD PLAIN INFORMATION: AGUA HEDIONDA CREEK, PACIFIC OCEAN TO BUENA, SAN DIEGO COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-07087

FLOOD HAZARD ANALYSIS: FOUR MILE AND EIGHT MILE CREEKS, BUTLER COUNTY, KANSAS.
Soil Conservation Service, Salina, Kans.
For primary bibliographic entry see Field 4A.
W75-07088

RESEARCH NEEDS RELATED TO HYDROLOGIC ASPECTS OF WATER FOR ENERGY FROM LARGE ENERGY COMPLEXES,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6D.
W75-07093

WASTE WATER TREATMENT WORKS DATA BOOK.
Illinois State Environmental Protection Agency, Springfield.
For primary bibliographic entry see Field 5D.
W75-07109

1973 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,
Oregon State Water Resources Board, Salem.
C. L. Wheeler.
1973. 246 p, 3 fig.

Descriptors: *Data collections, *Streamflow, *Precipitation(Atmospheric), Rivers, Streams, Water resources, Surface waters, Surface runoff, Stream gages, Gaging stations, Rainfall, Rain gages, Basic data collections, Hydrologic data, Meteorological data, Climatic data, Meteorology, Hydrology.

The surface water records for the 1973 water year (October 1, 1972, through September 30, 1973) for gaging stations and miscellaneous sites within Oregon were given. The base data collected at gaging stations consists of records of stage and measurements of discharge. In addition, observations of factors affecting the stage-discharge relation, weather records, and other information, were used to supplement base data in determining daily flow. The records of stage were primarily obtained from water-stage records that give a continuous record of fluctuations. A few records of stage were obtained from direct readings on nonrecording gages. Measurements of discharge were made with a current meter by the general methods outlined in standard textbooks on the measurement of stream discharge. Daily discharge was tabulated for 188 gaging stations, along with supporting information concerning the station. A section was included covering the precipitation data from storage precipitation stations operated by the Stage Engineer under a cooperative program with the National Oceanic and Atmospheric Administration and from storage precipitation stations operated by the U.S. Forest Service. Daily precipitation amounts were reported for 127 locations. Descriptions of the gages, their operation, and the data were provided. The period of record for the rainfall data is also from October 1, 1972 through September 30, 1973. (Sims-ISWS)
W75-07150

A TEST OF AN EXPERIMENTAL POLAR-ORBITING SATELLITE SYSTEM FOR RELAYING HYDROLOGICAL DATA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7B.
W75-07201

SIMULATED DRAWDOWN FOR SELECTED WELL FIELDS IN THE OHIO RIVER ALLUVIAL AQUIFER,
Geological Survey, Louisville, Ky.
For primary bibliographic entry see Field 4B.
W75-07209

INDEX OF FLOOD MAPS FOR CALIFORNIA PREPARED BY THE U.S. GEOLOGICAL SURVEY THROUGH 1974,
Geological Survey, Menlo Park, Calif.
J. R. Crippen.
Open-file report, March 1975. 29 p.

Descriptors: *Maps, *Floods, *California, Flood data, Flood plains, Flood plain zoning, Floodways.
Identifiers: *Flood maps, *Flood-prone areas.

An index is presented of quadrangle flood maps prepared by the U.S. Geological Survey in California through 1974. The maps are listed alphabetically for the entire State as well as by county. The index was prepared from a computer file of such maps. A similar, but more comprehensive, national file includes these maps with others for the entire Nation. A program is available for the national file that can retrieve map data by land-line location or by State and county. Both the file presented here and the national file are designed to be periodically updated. (Knapp-USGS)
W75-07216

HYDROLOGY OF THE OKLAWAHA LAKES AREA OF FLORIDA,
Geological Survey, Tallahassee, Fla.
P. W. Bush.
Florida Bureau of Geology, Tallahassee, Map Series No 69, 1974. 1 sheet, 9 fig, 11 ref.

Descriptors: *Eutrophication, *Limnology, *Water pollution sources, *Florida, Farm wastes, Fertilizers, Industrial wastes, Hydrogeology, *Maps.
Identifiers: *Oklawaha lakes(Fla).

Lakes Apopka, Carlton, Beauclair, Dora, Eustis, Harris, Little Harris, Griffin, and Yale are part of a chain of lakes that is the most prominent feature of the upper Oklawaha River drainage basin in central Florida. The main use of the lakes is recreation, but the desirability of most of the lakes for recreation has decreased in recent years. Land-use practices have caused the lake water quality to deteriorate. The main cause of cultural eutrophication in the Oklawaha lakes is muck farming of the reclaimed marsh and wetlands along the north shore of Lake Apopka. To maintain optimum water levels while growing crops, water is pumped from the farms to Lake Apopka and to Apopka-Beauclair Canal when water is in excess, and allowed to flow by gravity from the lake to the farms when water is deficient. Water from the farms is rich in nutrients dissolved from the highly organic muck and from fertilizers. Since Lake Apopka and Apopka-Beauclair Canal are at the head of the chain of lakes, nutrient-rich water flows to the downstream lakes. Other sources of the nutrients that enter the lakes are sewage treatment plants and industrial plants, primarily citrus processing plants. (Knapp-USGS)
W75-07220

SURFACE WATER FEATURES OF FLORIDA,
Geological Survey, Tallahassee, Fla.
L. J. Snell, and W. E. Kenner.
Florida Bureau of Geology, Tallahassee, Map Series No 66, 1974. 1 sheet, 1 map, 2 tab, 5 ref.

Descriptors: *Surface waters, *Florida, Streams, Lakes, Springs, Swamps, Wetlands, *Maps.

The variety of surface-water features of Florida is the result of the State's location in the subtropical zone between the Atlantic Ocean and the Gulf of Mexico, its average rainfall of 53 inches, its relatively flat terrain, and the nature of the its soils and underlying rocks. The surface-water features include extensive marshes and swamps, many streams, lakes, and ponds in certain parts of the State, few streams in the Central Highlands, and the extensive network of ditches and canals, particularly in the southeastern part. The great marshes and swamps and the other wetlands throughout the State are the most typical and outstanding surface-water features. These wetlands, which have been the habitat of subtropical and tropical wildlife in Florida, are altered by the works of man through the vast networks of ditches and canals for the development of land for citrus and other crops and for residential and recreational uses. Another prominent surface-water feature is the large number of lakes and ponds, 7,712 that are 10 or more acres in area and 19 larger than 6,400 acres (10 square miles). Lake Okeechobee is the largest freshwater lake in the United States wholly within a single State. Some lakes are connected to the deep artesian aquifer and are called 'sinkhole' lakes; some occupy depressions that were shallow marine basins or bays in past geologic time; others are underlain by peat or clay and are not well connected with water-bearing formations. Most streams have low gradients and their flow is sluggish because of the relatively flat terrain and low altitudes characteristic of Florida. (Knapp-USGS)
W75-07221

GROUND-WATER WITHDRAWALS IN THE UPPER PEACE AND UPPER ALAFIA RIVER BASINS, FLORIDA,
Geological Survey, Tallahassee, Fla.
A. F. Robertson, and L. R. Mills.
Florida Bureau of Geology, Tallahassee, Map Series No 67, 1974. 1 sheet, 9 fig, 1 tab, 7 ref.

Descriptors: *Groundwater, *Withdrawal, *Florida, Industrial water, Irrigation water, Municipal water, Water levels, Drawdown, Aquifers, Groundwater basins, *Maps.
Identifiers: *Peace River(Fla), *Alafia River(Fla).

In 1971, 120 billion gallons of groundwater was withdrawn from the Floridan Aquifer in the upper Peace and upper Alafia River bains, Florida. Withdrawals increased from 22 billion gallons in 1935 to 143 billion gallons in 1968. Industries associated with phosphate mining and production and with citrus processing used about 76 billion gallons in 1971. Withdrawals for irrigation were 33 billion gallons and for municipal supplies were 11.6 billion gallons in 1971. The decrease in total water withdrawals since 1968 is caused mainly by the decrease in industrial withdrawals. Posphate mining operations, using more recirculated water from holding ponds, have reduced their withdrawals from the aquifer for make-up water. Increased annual withdrawals have resulted in declines of water levels in the Floridan Aquifer of more than 40 feet since 1949. Seasonal variations in groundwater withdrawals are reflected in seasonal water-level fluctuations of as much as 20 feet over the central and southern parts of the area of investigation. (Knapp-USGS)
W75-07222

ANNUAL REPORT ON GROUND WATER IN ARIZONA--WITH EMPHASIS ON GILA BEND BASIN, MCMULLEN VALLEY, AND THE SOUTHEAST PART OF THE HARQUAHALA PLAINS--SPRING 1973 TO SPRING 1974.
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W75-07223

INDEX OF SURFACE WATER STATIONS IN TEXAS, OCTOBER 1974.
Geological Survey, Austin, Tex.
Texas District report, 1974. 21 p, 1 plate, 2 tab.

Descriptors: *Water measurement, *Texas, *Gaging stations, Stream gages, Discharge measurement, Surface waters, Water quality, Peak discharge, Flood data, Reservoirs, Tides, Sediments, Pesticides.

This index of surface-water measuring stations in Texas shows the station number and name, type of record collected, and the office at which the basic data are permanently filed. A permanent numerical designation for gaging stations has been adopted on a nationwide basis; stations are numbered and listed in downstream order. As of October 1, 1974, 471 stream-gaging, 81 reservoir-content, 12 stage, 15 flood-hydrograph partial-record, 8 flood-profile partial-record, 103 low-flow partial-record, 46 crest-stage partial-record, 48 tide-level, 11 periodic water-quality, 128 daily chemical-quality, 28 continuous-recording water-quality, 73 periodic chemical-quality, 145 periodic organic-quality, 95 pesticide, 8 sediment, 53 periodic sediment, 58 periodic biological, and 57 reservoir-inventory stations were in operation. (Knapp-USGS)
W75-07224

PHYSIOGRAPHIC MAP OF THE OKALOACOOCHEE SLOUGH IN COLLIER COUNTY, FLORIDA,
Geological Survey, Miami, Fla.
B. F. McPherson, and H. J. McCoy.
Open-file map, April 1974. 1 sheet.

Descriptors: *Wetlands, *Swamps, *Florida, *Maps, Photogrammetry, Terrain analysis, Geomorphology, Physiography.
Identifiers: *Physiographic maps, *Okaloacoochee Slough(Fla).

This map shows the physiographic boundaries of the Okalacoochee Slough within the Big Cypress Area of critical State concern, Collier County, Florida. It also shows the major wetland extensions of the slough and the direction of flow from the slough into these areas. Islands of higher land occur in the slough, and diking and other agricultural development are evident in places. (Knapp-USGS)
W75-07225

SEDIMENT YIELDS OF STREAMS IN THE UMPQUA RIVER BASIN, OREGON,
Geological Survey, Portland, Oreg.
D. A. Curtiss.
Open-file report, 1975. 1 sheet, 1 map, 1 tab, 8 ref.

Descriptors: *Sediment yield, *Suspended load, *Bed load, *Oregon, Sediment discharge, Discharge(Water).
Identifiers: *Umpqua River(Oreg).

Sediment data were collected at 11 sites in the Umpqua River basin, Oregon, from 1956 to 1973. Bedload was estimated to be 3 percent of the mean annual suspended-sediment yield, except for the Cow Creek basin, where bedload was estimated to be 5 percent. A regionalized map provides a visual generalization of discharge-weighted concentrations. The estimated mean annual suspended-sediment yields from the 11 sites in the Umpqua River basin ranged from 260 tons per square mile on Olalla Creek near Tenmile to 1,900 tons per square mile on Lookingglass Creek near Brockway. These values represent a long-term average and may differ greatly from year to year depending on hydrologic conditions in a given year. (Knapp-USGS)
W75-07226

HISTORY OF HYDROLOGY--A BRIEF SUMMARY,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 2A.
W75-07227

FLOOD MAPPING IN CHARLOTTE AND MECKLENBURG COUNTY, NORTH CAROLINA,
Geological Survey, Charlotte, N.C.
For primary bibliographic entry see Field 4A.
W75-07230

WATER RESOURCES INVESTIGATIONS IN FLORIDA, 1974.
Geological Survey, Reston, Va.
Water Resources Investigations Folder for Florida, 1974. 1 sheet, 1 map.

Descriptors: *Water resources, *Investigations, *Florida, Data collections, Hydrologic data, Surveys, Water quality, Groundwater, Surface waters.

The water-resources program of the U.S. Geological Survey in Florida consists of the collection of basic information through its hydrologic-data stations, areal hydrologic and interpretive studies, and research projects. The basic data collected, the results of the areal studies, and the research findings are presented mainly in publications of the U.S. Geological Survey and State agencies, but some appear also in technical journals, open-file reports, and other publications. This folder contains a brief description of the water-resources investigations in Florida in which the U.S. Geological Survey participates, and a list of selected references. (Knapp-USGS)
W75-07231

STREAMFLOW CHARACTERISTICS IN NORTHEASTERN UTAH AND ADJACENT AREAS,
Geological Survey, Salt Lake City, Utah.
F. K. Fields.
Utah Department of Natural Resources, Salt Lake City, Basic-Data Release No 25, 1975. 190 p, 1 fig, 2 tab.

Descriptors: *Basic data collections, *Hydrologic data, *Utah, *Streamflow, Surface waters, Gaging stations, Peak discharge, Low flow, Duration curves.

This report contains statistical summaries of streamflow records from 74 gaging stations, which are mostly in northeastern Utah. Low-flow, high-flow, and flow-duration summaries were compiled from daily discharge values; and flows of each month are compared through correlation with flows of 1, 2, and 12 months in the future. (Knapp-USGS)
W75-07232

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1975 FISCAL YEAR,
Geological Survey, Madison, Wis.
R. A. Lansing.
Wisconsin District report, February 1975. 46 p.

Descriptors: *Investigations, *Water resources, *Data collections, *Hydrologic data, *Wisconsin, Federal government, Water yield, Surface waters, Groundwater, Water quality.

The water-resources investigations of the Wisconsin District of the U.S. Geological Survey, Water Resources Division, consist of the collection of basic records through the hydrologic-data network, interpretive studies, and research projects. Much of the work of the U.S. Geological Survey is a cooperative effort in which planning and financing are shared by state and local governments or other Federal agencies. This report describes the water-resources projects and activities of the U.S. Geological Survey in Wisconsin for the 1975 fiscal year (July 1, 1974 to June 30, 1975). The included map shows the locations of areal studies (other than statewide); statewide basic-record sites; low-flow, partial-record sites; and crest-stage, partial-record sites. The report also contains a listing of all publications that have been prepared or contributed to by the Wisconsin District. (Knapp-USGS)
W75-07233

HYDROLOGIC UNIT MAP--1974, STATE OF WEST VIRGINIA.
Geological Survey, Reston, Va.
For Sale by USGS, Nat'l Center, 12201 Sunrise Valley Dr., Reston, Va. 22092, $1.00. Hydrologic Unit Map of West Virginia, 1974. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *West Virginia, Water resources, Data collections, Planning, *Networks.
Identifiers: *Hydrologic unit maps.

This map and accompanying table show Hydrologic Units in West Virginia that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Knapp-USGS)
W75-07234

HYDROLOGIC UNIT MAP--1974, STATE OF INDIANA.
Geological Survey, Reston, Va.
For sale by USGS, Nat'l Center, 12201 Sunrise Valley Dr., Reston, Va. 22092, $1.00. Hydrologic Unit Map of Indiana, 1974. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Indiana, Water resources, Data collections, Planning, *Networks.
Identifiers: *Hydrologic unit maps.

This map and accompanying table show Hydrologic Units in Indiana that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Knapp-USGS)
W75-07235

HYDROLOGIC UNIT MAP--1974, STATE OF PENNSYLVANIA.
Geological Survey, Reston, Va.
For sale by USGS, National Center, 12201 Sunrise Valley Dr., Reston, Va. 22092, $1.00. Hydrologic Unit Map of Pennsylvania, 1974. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Pennsylvania, Water resources, Data collections, Planning, *Networks.
Identifiers: *Hydrologic unit maps.

This map and accompanying table show Hydrologic Units in Pennsylvania that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Knapp-USGS)
W75-07236

HYDROLOGIC UNIT MAP--1974, STATE OF OHIO.
Geological Survey, Reston, Va.
For sale by USGS, Nat'l Center, 12201 Sunrise Valley Dr., Reston, Va. 22092, $1.00. Hydrologic Unit Map of Ohio, 1974. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Ohio, Water resources, Data collections, Planning, *Networks.
Identifiers: *Hydrologic unit maps.

This map and accompanying table show Hydrologic Units in Ohio that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Knapp-USGS)
W75-07237

MAP SHOWING DEPTH TO WATER, ANCHORAGE AREA, ALASKA,
Geological Survey, Anchorage, Alaska.
G. W. Freethey, J. W. Reeder, and W. W. Barnwell.
Open-file report, 1974. 1 sheet, 1 map.

Descriptors: *Water table, *Alaska, *Maps, Hydrologic data, Water wells, Water levels.
Identifiers: *Anchorage(Alaska).

This generalized map shows the approximate depth from land surface to the top of the saturated zone near Anchorage, Alaska. The depths were determined from boring and well data collected from 1955 to 1973. The configuration of the depth units displays the effect of the irregular topography in the Anchorage Area. (Knapp-USGS)
W75-07238

MAP SHOWING DRAINAGE AREAS, MIDDLETOWN QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
M. P. Thomas, and J. E. Palmer.
Miscellaneous Field Studies Map MF-639 A (Connecticut Valley Urban Area Project), 1975. 1 sheet, 1 map, 1 ref.

Descriptors: *Drainage area, *Connecticut, Streamflow, Watersheds(Basins).
Identifiers: *Middletown(Conn).

This map shows stream systems and drainage areas that contribute streamflow to selected sites on streams in the Middletown Quadrangle, Connecticut. Drainage areas shown have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Knapp-USGS)
W75-07239

CONTOUR MAP OF THE BEDROCK SURFACE, MOUNT HOLYOKE QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-640 A (Connecticut Valley Urban Area Project Contribution 121), 1975. 1 sheet, 1 map, 3 ref.

Descriptors: *Bedrock, *Massachusetts, *Subsurface mapping, Subsurface investigations, *Contours, Aquifers, Geologic mapping, *Maps.
Identifiers: *Mt. Holyoke(Mass).

Contours show the altitude of the bedrock surface in the Mt. Holyoke quadrangle, Massachusetts. The position of the contours is based largely on data from wells and test holes, geophysical studies, and the published geologic map supplemented by knowledge of the geologic history of the region. The map shows the configuration of the bedrock surface if all unconsolidated earth materials were removed. (Knapp-USGS)
W75-07240

ESTIMATES OF TEMPERATURE AND PRECIPITATION FOR NORTHEASTERN UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4A.
W75-07241

DELINEATION OF BURIED GLACIAL-DRIFT AQUIFERS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2F.
W75-07242

THE JANUARY GLOBAL CLIMATE SIMULATED BY A TWO-LEVEL GENERAL CIRCULATION MODEL: A COMPARISON WITH OBSERVATION,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2B.
W75-07253

THE USE OF THE DIGITAL SIMULATION LANGUAGE PDEL IN HYDROLOGIC STUDIES,
Wayne State Univ., Detroit, Mich. Dept. of Mathematics.
For primary bibliographic entry see Field 2F.
W75-07254

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: HYDRAULICS OF SURFACE WATER RUNOFF,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2A.
W75-07278

COMPUTER-CALCULATED GEOMETRIC CHARACTERISTICS OF MIDDLE-MISSISSIPPI RIVER SIDE CHANNELS; VOLUME 1: PROCEDURES AND RESULTS; VOLUME 2: SIDE CHANNEL CONTOUR MAPS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-07282

MATHEMATICAL MODEL STUDY OF A FLOW CONTROL PLAN FOR THE CHESAPEAKE AND DELAWARE CANAL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-07289

WATER QUALITY MODEL OF THE LOWER FOX RIVER, WISCONSIN,
Environmental Protection Agency, Washington, D.C. Office of Enforcement and General Counsel.
For primary bibliographic entry see Field 5B.
W75-07327

THE BOD5/DO RATIO. A NEW ANALYTICAL TOOL FOR WATER QUALITY EVALUATION,
Environmental Protection Agency, Philadelphia, Pa. Region III.
For primary bibliographic entry see Field 5A.
W75-07329

8. ENGINEERING WORKS

8A. Structures

EARTH MANUAL, A WATER RESOURCES TECHNICAL PUBLICATION.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W75-07046

ENVIRONMENTAL CONSIDERATIONS FOR CONSTRUCTION PROJECTS.
Agency for International Development, Washington, D.C. Office of Science and Technology.
For primary bibliographic entry see Field 6G.
W75-07047

CONSIDERATIONS FOR ANALYSIS OF INFILTRATION-INFLOW,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W75-07117

WASTE WATER MANAGEMENT - IMPLICATIONS FOR REGIONAL PLANNING,
P. D. Spreiregen.
In: The Merrimack: Design for a Clean River, American Society of Civil Engineers, National Meeting, Session No. 17, Washington, D.C., January 30, 1973. 11 p, 1 fig.

Descriptors: *Alternate planning, *Administration, *Water pollution control, *Regional analysis, *Aesthetics, *Architecture, Waste water treatment, Social impact, Effects, Environmental effects, Environmental engineering, New Hampshire, Massachusetts, Multiple-purpose projects.
Identifiers: *Merrimack River Basin, Management implications.

Possible parameters for evaluating development proposals, regional planning and development proposals, regional planning and development sequence for wastewater treatment are discussed. These evaluations would start with a regional ecological inventory focusing on identifying the three domains of nature: wilderness, rural and urban. Various patterns of geology, climate, vegetation and wildlife would be identified as well as various degrees of intervention and alteration to begin a regional ecological inventory. Site analysis would include evaluating the results of man-made changes by rating the quality of cultivated areas, outdoor recreation places, towns and cities. This process would help discern the compatability of a site's characteristics with the site's actual usage. The second facet of wastewater management would involve design. This includes evaluating landscapes from a visual standpoint, and then determining the appropriate character of engineering or architectural works in each sort of landscape. The three ranges of landscapes are: (1) visually weak landscapes with visually strong structures; (2) visually strong landscapes with visually weak structures; and (3) visually moderate landscapes with visually moderate structures. Therefore, in the management of wastewater using the element of design, it is necessary to emulate the scale, rhythmn, and massing in a completely contemporary way. In the case of the Merrimack River Basin wastewater management study, some of the ponderables considered were: how worn urban waterfronts could be revitalized and humanized, how a flow augmentation outfall could be handled as an esthetic landscape element, how carbon absorption columns could be deployed, or how aeration or storage lagoons could be designed and tailored to landscape. (Poertner)
W75-07120

CAN THE BALTIC SEA BE TURNED INTO A FRESHWATER LAKE,
For primary bibliographic entry see Field 4A.
W75-07165

ANALYSIS OF LONGITUDINAL BEHAVIOUR OF BURIED PIPES,
Sydney Univ. (Australia).
For primary bibliographic entry see Field 8D.
W75-07166

DEVELOPMENT OF JAMES BAY: THE ROLE OF ENVIRONMENTAL IMPACT ASSESSMENT IN DETERMINING THE LEGAL RIGHT TO AN INTERLOCUTORY INJUNCTION,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 6G.
W75-07175

ECOLOGICAL CHANGES DUE TO HYDROELECTRIC DEVELOPMENT ON THE SAINT JOHN RIVER,
Fisheries and Marine Service, Halifax (Nova Scotia). Resource Development Branch.
For primary bibliographic entry see Field 6G.
W75-07176

IMPACT OF THE BENNETT DAM ON THE PEACE-ATHABASCA DELTA,
Canadian Wildlife Service, Edmonton (Alberta).
For primary bibliographic entry see Field 6G.
W75-07177

ASSESSMENT OF THE IMPACT OF HYDRO-DAMS,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
For primary bibliographic entry see Field 6G.
W75-07178

STABILITY OF STRUCTURES WITH INTERMEDIATE FILTERS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India). Ground Water Div.
A. S. Chawla.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY2, Proceedings Paper 11139, p 223-241, February 1975. 10 fig, 11 ref, 2 append.

Descriptors: *Seepage, *Hydraulic structures, *Potential flow, *Uplift pressure, Drainage, Dam design, Foundations, Analysis, Equations, Stability, Filters, Seepage control, Design data, Soil mechanics, Permeability.
Identifiers: *Conformal mapping, Complex variables.

A seepage problem of a horizontal plane of drainage located between two cutoff walls was investigated. The problem was solved exactly by use of conformal mapping. Equations for the seepage discharge to the filter and for the uplift pressures on the base were given. These equations were solved numerically for pressures at key points. The results were presented in charts of design curves. Uplift pressures were found to reduce considerably along the entire length of the structure even if a very short filter was provided. Various lengths and locations of the filter were investigated to determine the best results. It was found that the filter should be located such as to minimize the total uplift on the base downstream of the gateline. Increasing the depth of the downstream cutoff resulted in increased uplift pressure downstream of the filter. (Adams-ISWS)
W75-07183

DISCHARGE OVER POLYGONAL WEIRS,
Technische Hochschule, Aachen (West Germany). Inst. for Water Resources Development.
For primary bibliographic entry see Field 8B.
W75-07187

LAKE MICHIGAN INTAKES: REPORT ON THE BEST AVAILABLE TECHNOLOGY.
Lake Michigan Cooling Water Intake Technical Committee, Chicago, Ill.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 112, $5.75 in paper copy, $2.25 in microfiche. Report August 1973. 140 p, 19 fig, 8 tab, 75 ref.

Descriptors: *Lake Michigan, *Intakes, *Technology, Aquatic life, Monitoring, Entrainment, Fish, Bypasses, Screens, Cooling water, Industrial water, Municipal water, Hydroelectric plants, Design, Environmental effects, Installation, Intakes structures.
Identifiers: Fish protection.

In view of the various ecological situations, no generic type intake structure or system can be recommended. Each proposed and existing intake should be considered independently utilizing the best technology for protecting aquatic life. The single most important factor is the intake location. The adequacy of existing intake facilities must be determined by a monitoring program measuring the daily and seasonal variations in numbers, size and weight of all life stages of fish species entrapped in the intake system. Areas where fish concentrate should be determined and avoided. The intake structure should not serve as an attractant to immature and adult fish either by physical alteration of the environment, by providing shelter or by the influence of heated discharge water, unless deicing is essential for maintenance of water flow. In the absence of other adequate fish-protection devices, intake water velocities should not exceed the fish escape velocities. Fish should be returned undamaged from the forebay area to a physical environment approximating that at point of withdrawal through a well designed return system. Horizontal traveling screens and louver screens appear to have the greatest potential as fish-protection devices where fish bypasses are required. Intake designs, exclusion devices, bypass and fish removal systems, and infiltration systems are detailed. (Jones-Wisconsin)
W75-07294

8B. Hydraulics

INCREASING WATER USE EFFICIENCY THROUGH IMPROVED ORFICE DESIGN AND OPERATIONAL PROCEDURES FOR SUB-IRRIGATION SYSTEMS,
Texas A and M Univ., College Station. Water Resources Inst. Office of Water Research and Technology.
For primary bibliographic entry see Field 3F.
W75-06991

RIVER AND ESTUARY MODEL ANALYSIS, VOLUME 3.
For primary bibliographic entry see Field 2E.
W75-06998

SIMULATION OF SEDIMENT TRANSPORT IN HYDRAULIC MODELS,
Technische Universitaet, Obernach (West Germany). Versuchsanstalt fuer Wasserbau-Oskar von Miller-Institut.
For primary bibliographic entry see Field 2J.
W75-06999

THE TIDAL REGIME OF THE ELBE-RIVER, HYDRAULIC MODEL WITH MOVABLE BED,
Bundesanstalt fur Wasserbau, Hamburg (West Germany).
For primary bibliographic entry see Field 2L.
W75-07001

STUDIES FOR CHALNA PORT IN THE DELTA OF GANGES RIVER,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia). Hydraulic Lab.
M. Vojinovic, and J. Muskatirovic.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 49-61. (1973). 5 fig.

Descriptors: *Model studies, *Tidal streams, *Deltas, *Harbors, Alluvial channels, Hydraulic models, Rivers, Tidal waters, River flow, Navigable rivers, Regime, River regulation, Currents(Water), Discharge(Water), Freshwater, Tidal effects.
Identifiers: *India(Pussur River), *India(Ganges River), Fixed bed model, Movable bed model.

In the delta of the Ganges River the construction of a new big Chalna Port on the Pussur River is anticipated. For this purpose, observations and measurements of the behavior of the Pussur River and hydraulic model studies were performed. The regime of the Pussur River and its natural development and influence of regulation works on tidal and fresh water regime were analyzed. Velocity and discharge measurements and observation of flow patterns were presented. Studies on a physical model of the present flow conditions and the effect of the Chalna Port on the flow conditions of the Pussur River were analyzed. It was concluded that with construction of the Chalna Port natural stability of the reach will not be disturbed. (See also W75-06998) (Humphreys-ISWS)
W75-07003

COMBINATION OF A PHYSICAL AND A MATHEMATICAL RIVER MODEL WITH FIXED BED,
Bundesanstalt fuer Wasserbau, Karlsruhe (West Germany).
For primary bibliographic entry see Field 2E.
W75-07005

RIVER SIMULATION BY CHANNEL NETWORK ANALYSIS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
For primary bibliographic entry see Field 2E.
W75-07006

DETERMINATION OF DISCHARGE SCALE FOR A TIDAL MODEL OF A COMPLEX RIVER,
Irrigation and Power Research Station, Poondi (India).
For primary bibliographic entry see Field 2L.
W75-07007

SOME NOTES ON HYDRAULIC MODEL TESTS OF RIVER CHANNELS,
Public Works Research Inst., Kashima (Japan). Kashima Hydraulics Lab.
For primary bibliographic entry see Field 2E.
W75-07008

HYDRAULIC MODELING OF UNSTEADY FLOWS OF THE MEKONG RIVER,
Asian Inst. of Tech., Bangkok (Thailand), Div. of Water Science and Engineering.
For primary bibliographic entry see Field 2E.
W75-07010

AN APPROACH TO THE MODELING OF THE MEKONG AT PHNOM PENH,
Makerere Univ., Kampala (Uganda). Faculty of Technology.
For primary bibliographic entry see Field 2E.
W75-07011

THE INFLUENCE OF TIDAL INLET CURRENTS ON THE PROPAGATION OF WAVE ENERGY INTO ESTUARIES - PHYSICAL MODEL INDICATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2L.
W75-07013

ON AN EFFECT OF RIVER DISCHARGE TO TSUNAMI IN A MODEL OF URADO BAY,
Kyoto Univ. (Japan). Disasters Prevention Research Inst.
For primary bibliographic entry see Field 2L.
W75-07014

MODEL SIMULATION OF THE DOWNSTREAM EFFECTS OF OPERATING THE SIRIKIT POWER STATION,
Electricity Generating Authority of Thailand, Nonthaburi. Planning Dept.
S. Aphaiphuminart, and J. E. Cowley.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River

Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 195-206, (1973). 4 fig, 1 tab.

Descriptors: *Model studies, *Rivers, *Diversion dams, *Hydroelectric plants, Hydraulic models, Calibrations, Laboratory tests, Evaluation, Water level fluctuations, Streamflow, Downstream.
Identifiers: *Thailand(Nan River).

The design, construction, and operation were described of a scale model of a 300-kilometer length of the Nan River. The results of simulation of an extensive series of situations in which the Sirikit power station was operated in conjunction with the two diversion structures planned for this reach were presented. From detailed simulation of a wide range of conditions, it was shown that up to four 125 MW generating units can be used at the Sirikit power station, in any pattern of peaking, without compromising downstream interests. The only provision attached to this conclusion is that the total volume of water released each day be sufficient to meet the average flow from the reservoir needed downstream. (See also W75-06998) (Humphreys-ISWS)
W75-07015

THE APPLICATION OF RIVER SYSTEM MECHANICS,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07017

THE STOCHASTIC METHOD IN RIVER MECHANICS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07020

FLOOD-ROUTING IN NON-PRISMATIC CHANNELS USING AN IMPLICIT METHOD OF SOLUTION,
Liverpool Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07021

SUBMERGENCE COMPUTATIONS UPSTREAM OF CHANNEL OBSTRUCTIONS,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
N. S. L. Rao, and K. Sridharan.
In: River and Estuary Model Analysis, Volume III; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 361-370, (1973). 11 fig, 3 ref.

Descriptors: *Flow profiles, *Open channels, *Backwater, Froude number, Length, Gradually varied flow, Estimating.
Identifiers: M1 type, S1 type, Nondimensional, Rectangular channels, Trapezoidal channels, Triangular channels, Parabolic channels.

Using normal flow Froude number as a reference parameter, computations had been made for generalised nondimensional backwater profiles of M1 and S1 type for several common channel shapes including rectangular, trapezoidal, triangular, and parabolic. The results were presented in terms of the nondimensional profile length for different pool elevations at the downstream end. The figures presented can be used to obtain a quick estimate of the backwater profile lengths. (See also W75-06998) (Humphreys-ISWS)
W75-07029

UNSTEADY FLOW IN OPEN CHANNEL WITH MOVABLE BED,
National Taiwan Univ., Taipei.
For primary bibliographic entry see Field 2E.
W75-07037

GENERAL REPORTS, DISCUSSIONS, LECTURES, VOLUME 4.
For primary bibliographic entry see Field 2J.
W75-07038

APPLICATION OF PHYSICAL AND MATHEMATICAL MODELS FOR RIVER PROBLEMS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2A.
W75-07040

STATISTICAL PROPERTIES OF WAVE-CURRENT FORCE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering, and North Carolina State Univ., Raleigh. Dept. of Geosciences.
For primary bibliographic entry see Field 2L.
W75-07070

A NEW TECHNIQUE FOR BEACH EROSION CONTROL,
North Carolina State Univ., Raleigh. Center for Marine Coastal Studies.
For primary bibliographic entry see Field 2J.
W75-07073

STUDY OF TRACE ELEMENTS IN WATERS OF TWO ALASKAN RESERVOIR SITES,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W75-07100

MATHEMATICAL MODELS OF MAJOR DIVERSION STRUCTURES IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWER SYSTEM,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5D.
W75-07142

DEVELOPMENT OF A COMPUTER PROGRAM TO ROUTE RUNOFF IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWERS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5D.
W75-07143

REAL-TIME ESTIMATION OF RUNOFF IN THE MINNEAPOLIS-ST. PAUL METROPOLITAN AREA,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5G.
W75-07144

THE REAL-TIME COMPUTATION OF RUNOFF AND STORM FLOW IN THE MINNEAPOLIS-ST. PAUL INTERCEPTOR SEWERS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5G.
W75-07145

GEOTHERMAL DRILLING IN KLAMATH FALLS, OREGON,
Storey (E. E.) Well Drilling, Klamath Falls, Oreg.
D. M. Storey.
Presented at The Oregon Institute of Technology Geothermal International Conference, October 8, 1974. 10 p.

Descriptors: *Wells, *Thermal water, *Drilling, Heat exchangers, Geology, Heating, Drilling equipment, Economics, Geothermal studies, *Oregon, Costs.
Identifiers: *Geothermal wells, *Klamath Falls(Ore).

The drilling of geothermal wells in the Klamath Falls area is done by two methods. The most widely used is the percussion or cable rig. The other method used is the air-rotary. The construction of geothermal wells can be classed into two types of wells: those serving commercial facilities and those for residential use. The geothermal commercial well is constructed approximately the same as any other large well with the exception of installing casing. A string of casing may have to be set in the hole and cemented in to case off a flow of cold water. The depths of commercial wells will vary from 400 to 1805 feet. Residential wells will vary from 150 to 1000 feet in depth. They consist of drilling a 10 inch diameter hole to a depth where 'live' or moving hot water is encountered. This hot water ranges anywhere from 140 to 250+F. Two strings of 2-inch steel coils are set in the well to a depth determined by the depth of well and the water temperatures. City water is used to flow in the coils in the well. As heat is needed, water is moved through the coils by a circulating pump. The cost of a residential geothermal well ranges from $3000 to $10,000. A commercial geothermal well will cost up to $30,000 or more. (Sims-ISWS)
W75-07146

TURBULENT PRESSURE FIELD BENEATH A HYDRAULIC JUMP,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
M. H. A. Khader, and K. Elango.
Journal of Hydraulic Research, Vol 12, No 4, p 469-489, 1974. 7 fig, 4 tab, 19 ref.

Descriptors: *Turbulence, *Pressure, *Laboratory tests, *Hydraulic jump, *Open channel flow, Statistical methods, Hydraulics, Froude number, Hydraulic structures, Analysis, Data processing, Flumes.
Identifiers: *Spectral analysis, Stilling basins, Autocorrelation.

Statistical characteristics of the fluctuating pressure on the flume floor beneath a classical hydraulic jump were estimated by analog and digital analyses of data obtained in a laboratory flume. A relatively high intensity of pressure fluctuation equal to 0.085 times the initial dynamic pressure was obtained. This was due to the stage of flow development in the supercritical stream flowing over an Ogee weir. The characteristics evaluated showed little variation from the initial Froude number which ranged from 4.7 to 6.6. The structure of the turbulent pressure field was discussed in terms of moments of the probability density histograms, shape of the autocorrelation and spectral density functions, and the estimated time-microscales. (Adams-ISWS)
W75-07180

IMPROVEMENT OF THE 'BASELESS' PROPORTIONAL WEIR,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
N. S. L. Rao, and D. Chandrasekaran.
Journal of Hydraulic Research, Vol 12, No 4, p 491-498, 1974. 4 fig, 1 tab, 4 ref.

Descriptors: *Weirs, *Discharge(Water), *Discharge measurement, *Discharge coefficients, Hydraulics, Flow, Depth, Velocity, Hydrometry, Hydraulic structures.
Identifiers: *Baseless proportional weir, *Discharge-head relation, Relative errors.

Maintenance of accuracy in the measurements of different hydraulic quantities such as depth of flow, velocity, and discharge is an important

aspect of hydrometry. Improvements for a baseless weir already published were presented. This modification should reduce the errors in the measurement of discharges over the baseless weir. This is particularly true for small discharges over the weir. (Bhowmik-ISWS)
W75-07181

REMOVAL OF AIR FROM WATER LINES BY HYDRAULIC MEANS,
MacLaren (James F.) Ltd., Willowdale (Ontario). Hydrologic Sciences Div.
For primary bibliographic entry see Field 8C.
W75-07184

LOW-HEAD AIR-REGULATED SIPHONS,
Tana River Development Authority, Nairobi (Kenya).
For primary bibliographic entry see Field 8C.
W75-07186

DISCHARGE OVER POLYGONAL WEIRS,
Technische Hochschule, Aachen (West Germany). Inst. for Water Resources Development.
H. Indlekofer, and G. Rouve.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY3, Proceedings Paper 11178, p 385-401, March 1975. 12 fig, 5 tab, 13 ref, 2 append.

Descriptors: *Discharge coefficient, Hydraulics, *Hydraulic models, *Weirs, *Spillways, Hydraulic structures, Discharge(Water), Overflow, Spillways, Flow, Mathematics.
Identifiers: *Polygonal weirs, *Corner weirs.

Intake towers and weirs in reservoirs with small water depth (less than or equal to 30.0 m = 98.4 ft) and small floods (less than or equal to 100 cu m/s = 3500 cfs) can be designed with polygon in plan in several cases. The polygon is easier to construct compared to the circle in plan, but the hydraulic computation is more complicated. The influence of an individual corner of the polygonal weir on the discharge coefficient and therefore on the discharge capacity was shown. The independent variable hydraulic and geometric parameters, e.g., corner angle, weir height, and overfall head influenced the flow at the weir and over the weir crest in different ways. All the results of this basic investigations showed that a simple mathematical relation between disturbing effect of the corner and the overfall head can be assumed. A simplified two-dimensional flow theory was developed to make the hydraulic computation of the discharge capacity of polygonal weirs possible. (Bhowmik-ISWS)
W75-07187

TURBULENCE AND DIFFUSION INVESTIGATIONS IN A SUBMERGED AXISYMMETRIC WATER JET,
Ebasco Services, Inc., New York.
N. S. Shashidhara, and E. L. Bourodimos.
Water Resources Bulletin, Vol 11, No 1, p 77-96, February 1975. 14 fig, 6 tab, 41 ref.

Descriptors: *Jets, *Velocity, *Shear stress, *Turbulence, *Diffusion, Fluid mechanics, Equilibrium, Entrainment, Laboratory tests, Analytical techniques, Hydraulics.
Identifiers: *Submerged water jet, Mixing length, Self-preservation, Geometrical similarity.

The normalized mean velocity profile across the axis of a submerged water jet reaches self-preservation at a distance of 8-10 jet diameters downstream. The profile is gaussian and the velocity deceleration along the axis follows a hyperbolic pattern. Self-preservation implies that a given flow field with its components in dynamic equilibrium becomes geometrically similar at all sections. The mixing length is not a function of the axial distance but it does show a variation in radial direction. Self-preservation for turbulence intensities was noted at about 45 jet diameters distance and beyond. Radial variation of turbulence intensities did not show self-preservation even at 100 jet diameters distance downstream. The normalized turbulent shear stress had a minimum value of 0 at the axis. Variation of the efflux velocities (8, 10, or 12 ft/sec) did not have any appreciable effect on the overall characteristics of the jet. (Singh-ISWS)
W75-07192

THE USE OF THE DIGITAL SIMULATION LANGUAGE PDEL IN HYDROLOGIC STUDIES,
Wayne State Univ., Detroit, Mich. Dept. of Mathematics.
For primary bibliographic entry see Field 2F.
W75-07254

FRICTIONAL EFFECTS IN SIDE CHANNEL SPILLWAYS WITH INCREASING DISCHARGE,
Connecticut Univ., Storrs. Inst. of Water Resources.
V. E. Scottron.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-241 480, $3.25 in paper copy, $2.25 in microfiche. Completion Report, December 1974. 6 p, 4 fig, 21 ref, append. OWRT A-051-CONN (1) 14-31-0001-3807.

Descriptors: *Open channel flow, Discharge(Water), Spillways, Friction.
Identifiers: *Spatially varied flow, *Side-channel spillways, *Frictional effects, Roof gutters, Street gutters, Dam spillways.

A detailed experimental study of the frictional effects in side channel spillways with increasing discharge was conducted using a model of the convergence of two wide channels as a test case. Careful reworking of the analysis showed that a single momentum equation as used in the past was not sufficient to explain certain anomalies. Additional equations were developed for energy and mixing losses. These equations proved satisfactory in matching experimental results. (de Lara-Connecticut)
W75-07274

VAN BUREN REACH, ARKANSAS RIVER NAVIGATION PROJECT; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. J. Shows, and J. J. Franco.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-784 091, $10.25 in paper copy, $2.25 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report H-74-7, July 1974. 83 p, 4 tab, 30 pl.

Descriptors: *Hydraulic models, *Navigation, River training, Hydraulics, Arkansas, Model studies, Dikes, *Channel improvement, *River beds.
Identifiers: Arkansas River Navigation Project, *Arkansas River(Ark), Van Buren(Ark), Vane dikes.

The Van Buren reach of the Arkansas River is in Lock and Dam No. 13 pool near Van Buren, Ark., about river mile 353. The reach is characterized by three relatively flat bends and is crossed by three existing or proposed bridges. The location of the navigation spans of the two existing bridges could cause considerable difficulties in navigating the reach and in maintaining a channel of adequate dimensions based on the alignment of the navigation spans. A hydraulic model was constructed to an undistorted scale of 1:120. Originally the model was of the semifixed-bed type for the navigation studies. It was later converted to the movable-bed type. The investigation revealed: a. The channel had a natural tendency to develop in a sinuous alignment with the channel crossing first toward the right bank and then back toward the left bank, b. The best alignment for the channel insofar as navigation is concerned is along the left or convex side of the bend. c. Development of a channel along the left side would require considerable contraction and training structures. d. A system of vane dikes could be developed which would practically eliminate the need for maintenance dredging. (WES)
W75-07280

GEOMORPHOLOGY OF THE MIDDLE MISSISSIPPI RIVER,
Colorado State Univ., Fort Collins. Engineering Research Center.
S. A. Schumm, M. A. Stevens, and D. B. Simons.
Available from the National Technical Inofrmation Service, Springfield, Va., 22161, as AD-783 424. $5.25 in paper copy, $2.25 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Contract Report Y-74-2, July 1974. 110 p, 29 fig, 7 tab, 21 ref, 2 append.

Descriptors: *Channel Improvements, *Geomorphology, *Hydraulic models, Hydraulic structures, Hydraulics, *Mississippi River, River training, Illinois, Missouri, Channel morphology, Model studies, Flood protection, Flood stages, Dikes.
Identifiers: Side channels(Mississippi River), Middle Mississippi River, Notched dikes.

A comprehensive study of the historical geomorphology of the Middle Mississippi River was made to determine the physical impact of river contraction works on river morphology and behavior, and subsequent effects on the side channels. The studies included physical model studies of the river and side channels, the combined effects of navigation improvement structures and flood protection works on flood stages, and a review of the history of development and modification of the Middle Mississippi River. Based on the laboratory model studies, it was concluded that in nearly all field situations, the inlet to the side channel formed by dike fields is located in a position to receive unusually high quantities of sediment. Consequently, the life of these side channels can be increased if the intakes are closed soon after formation of the side channel. It is also possible to realign the river so that the intake to a side channel is in a favorabel position and alignment to obtain clear water and very little sediment. However, this would require massive structures to resist the forces of the main channel and would be extremely expensive. The use of notched dikes might help in extending the life of a few side channels. (WES)
W75-07281

COMPUTER-CALCULATED GEOMETRIC CHARACTERISTICS OF MIDDLE-MISSISSIPPI RIVER SIDE CHANNELS; VOLUME 1: PROCEDURES AND RESULTS; VOLUME 2: SIDE CHANNEL CONTOUR MAPS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-07282

UNSTEADY SALINITY INSTRUSION IN ESTUARIES; PART I: ONE-DIMENSIONAL, TRANSIENT SALINITY INTRUSION WITH VARYING FRESHWATER INFLOW; PART II: TWO-DIMENSIONAL ANALYSIS OF TIME-AVERAGED SALINITY AND VELOCITY PROFILES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 2L.
W75-07284

REMEDIAL PLANS FOR PREVENTION OF HARBOR SHOALING, PORT ORFORD, OREGON; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. E. Chatham, Jr., and M. L. Giles.
Available from the National Technical Information Service, Springfield, Va., 22161, as Ad-781 483, $7.00 in paper copy, $2.25 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report H-74-4, June 1974. 178 p, 26 tab, 98 photo, 12 pl, 10 ref.

Descriptors: Harbors, *Hydraulic models, *Shoals, *Waves(Water), *Oregon, Model studies, *Breakwaters, Hydraulic structures, Channel improvement, Optimum development plans, Hydraulics.
Identifiers: *Port Orford(Ore), *Harbor shoaling prevention.

A 1:100-scale undistorted hydraulic model of Port Orford, Oregon and sufficient offshore area to permit generation of the required test waves was used to develop and test several plans of improvement proposed to eliminate harbor shoaling without adversely affecting wave heights at the existing pier. Improvement plans consisted of (a) removal of portions of the existing breakwater, (b) realignment or lengthening of the existing breakwater, and (c) construction of new breakwater structures in the vicinity of Fort Point and Battle Rock. A 54-ft-long wave machine, electrical wave height measuring and recording apparatus, and coal and nylon tracer materials were used in the model. Tests were conducted with prebreakwater and existing breakwater conditions, and the results were compared to determine the causes and sources of harbor shoaling. Improvement plans were then tested and compared with existing prototype conditions. Of the plans tested, the optimum configuration appears to be a 600 ft extension of the basic planned breakwater structure, which would prevent material from entering the harbor and stabilize material already in the harbor. (WES)
W75-07285

STA-POND STABILITY TESTS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. D. Davidson.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Miscellaneous Paper H-74-7, August 1974. 39 p, 1 fig, 18 photo, 7 pl.

Descriptors: *Breakwaters, *Groins(Structures), *Hydraulic models, Stability, Waves(Water), Model studies, Hydraulics, Testing, Hydraulic structures, Groins(Structures), Testing procedures.
Identifiers: *Armor units(Hydraulics), *Stability tests.

Model tests were conducted on STA-POD armor units used on selected groin-type structures, subjected to the largest waves that can attack the units when placed in the surf zone in a water depth equal to the height of the unit. One preliminary test also was conducted to obtain an indication of the stability of STA-PODS when used on a breakwater slope (1:1.5). All tests were conducted in a wave flume 110 ft long, 4 ft wide, and 4 ft deep. The surf zone tests utilized a 1:25 model to prototype scale, while the breakwater slope tests used only model values. It was concluded from results of the surf zone tests, where the model STA-PODS were tested on a hard-surface slope, that 5-ton STA-PODS used as a groin or samll jetty type structure in the prototype would be stable for wave heights in excess of the 7.5 ft tested on the model. A small area of STA-PODS tested on a 1:1.5 breakwater slope indicated that random-placed STA-PODS interlocked and provided good stability characteristics. The use of STA-PODS as a breakwater unit would be practical, provided their structural stamina were sufficient to endure forces during prototype construction and storm action, and provided additional research indicated their damage coefficient was sufficiently large to make STA-PODS economically feasible. (WES)
W75-07287

ENVIRONMENTAL INVENTORY AND ASSESSMENT, ILLINOIS WATERWAY; 12-FOOT CHANNEL NAVIGATION PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. P. Emge, H. H. Allen, G. H. Hughes, G. S. Wilhelm, and J. H. Zimmerman.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Miscellaneous Paper Y-74-1, April 1974. 421 p, 136 ref, 19 append.

Descriptors: *Dredging, *Inland waterways, *Environmental effects, Illinois, Hydraulics, Channels, Navigation, Surveys, *Alternative planning, Water quality, Biota, Channel improvement.
Identifiers: *Illinois Waterway(Ill), *Navigation channels.

An environmental inventory was made of the Illinois Waterway, and environmental assessments were made of the four proposed alternatives to reach a 12-ft minimum navigation channel from an existing 9-ft minimum navigation channel on the Waterway. The proposed alternatives were: (1) raising the existing normal pool level by 3 ft, (2) dredging the channel 3 ft and transporting the dredged material to land disposal sites or depositing it in the open water, (3) raising the pool level 1.5 ft and dredging the channel 1.5 ft, and (4) no action. It was found that the Illinois Waterway varies significantly in its environmental quality from the upper reaches near Chicago where it is highly polluted to its lower reaches at Grafton, Illinois, where it is fairly diverse in biota. Particular areas on the Waterway deemed to have special environmental values were delineated and discussed relative to the various alternatives. (WES)
W75-07288

MATHEMATICAL MODEL STUDY OF A FLOW CONTROL PLAN FOR THE CHESAPEAKE AND DELAWARE CANAL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. H. Johnson.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Miscellaneous Paper H-74-10, September 1974. 38 p, 1 tab, 4 ref, 2 append.

Descriptors: *Canals, *Control structures, *Flow control, *Open channel flow, Hydraulics, *Mathematical models, Model studies, Hydraulic models, *Delaware, *Environmental control, Unsteady flow, Planning, Feasibility studies.
Identifiers: *Sea level canals, *Chesapeake and Delaware Canal(Del).

In 1954 Congress authorized an enlargement of the sea level canal connecting the Delaware River and the Chesapeake Bay. This enlargement was to provide a 35-ft by 450-ft channel section instead of the 27-ft by 250-ft channel which existed at that time. As of 1974, about 90 percent of the project has been physically completed. Extensive studies to define the ecological effects of channel enlargement have not thus far indicated any significant adverse effect which would warrant flow control in the canal. However, it was considered advisable to investigate the feasibility of flow control schemes in case such control ever became desirable. Of the various flow control schemes considered, a navigation lock and dam in the main canal, along with a small bypass canal was selected as the best flow control plan. A mathematical model, called SOCHMJ, for the computation of unsteady flows in a system composed of an unlimited number of open channels has been employed to determine the feasibility of such a flow control plan. The results from the mathematical model study indicate that the proposed flow control plan is feasible. (WES)
W75-07289

A RELATION BETWEEN GAMMA RADIATION AND PERMEABILITY, DENVER-JULESBERG BASIN,
Shell Oil Co., Denver, Colo.
For primary bibliographic entry see Field 4B.
W75-07335

UNIFIED FORMULATION OF WALL TURBULENCE,
Ebasco Services Inc., New York.
G-T. Teh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY12, p 2263-2271, December, 1972. 3 fig, 23 ref.

Descriptors: Hydraulics, *Turbulence, *Viscosity, *Roughness, Movement, *Roughness coefficient, Turbulent flow, Turbulent boundary layers, Hydraulic structures, Linings.
Identifiers: *Wall effects, Wall smoothness, Restricted flow.

In most analyses of the wall turbulence under neutral conditions, two assumptions have been made for the rear-wall region: (1) the mixing length is proportional to the distance from the wall and (2) the turbulent shear stress is constant over the region of interest. These two assumptions resulted in a logarithmic velocity profile valid in the near wall region. Because of the nature of this logarithmic function, the zero velocity condition at the wall cannot be specified. To determine the integration constant in the equation, an artificial distinction between the smooth and rough surface was introduced. By incorporating the effect of the viscosity into the roughness length model, allowing the total shear stress to vary linearly, and modifying the mixing length, the present theory gives good results for the entire flow region. The resulting equation covers the smooth wall as well as the rough wall flow. The equation also provides a single formula to describe the velocity profile in the three near-wall regions for a smooth surface. (Bradbeer-NWWA)
W75-07336

CAVITATION, A NOVEL DRILLING CONCEPT,
Mobil Research and Development Corp., Dallas, Tex. Field Research Lab.
F. A. Angona.
International Journal of Rock Mechanics, Mineralogical Sciences and Geomechanical Abstracts, Vol 11, p 115-119, 1974. 10 fig, 5 ref.

Descriptors: *Cavitation, *Corrosion, *Scour, *Fluid mechanics, *Drilling, Drilling fluids, Drilling equipment, Rotary drilling, Celerity, Erosion.
Identifiers: *Cavitation drilling, Lueders limestone.

An experimental investigation of cavitation erosion as a possible drilling mechanism is described. Cavitation is the phenomenon associated with the formation and violent collapse of bubbles in a liquid. The energy associated with the collapse of a single bubble is small, but the spherical convergence of the collapsing bubble generates an energy density sufficient to erode materials with strengths as high as that of tungsten. A focusing acoustic system enclosed in a pressure chamber permitted the sound pressure and the hydrostatic pressure to be independently varied over the range of 1-20 atmospheres. The intensity of cavitation, as measured by the erosion rate of Leuders limestone and aluminum, was found to increase as the third power of hydrostatic pressure. Experimental results obtained in this pressure range correlate

with published Soviet data taken at pressures up to 75 atmospheres. Extrapolation of data to 10,000 foot drilling conditions indicates penetration rates higher than those for rotary drilling provided a borehole transducer with an acoustic output in excess of 100 horsepower can be developed. (Bradbeer-NWWA)
W75-07337

8C. Hydraulic Machinery

POWER SHORTAGE CONTINGENCY PROGRAM FOR THE PACIFIC NORTHWEST, LEGISLATIVE, REGULATORY AND INSTITUTIONAL ASPECTS,
Kell, Alterman, Runstein and Thomas, Portland, Oreg.
For primary bibliographic entry see Field 6E.
W75-06977

PREVENTIVE MAINTENANCE,
East Bay Municipal Utility District, Oakland, Calif.
J. S. Harnett.
Journal American Water Works Association, Vol 61, No 8, August 1969. p 398-400.

Descriptors: *Maintenance, *Water districts, *Utilities, *Inspection, *Municipal water, *Operation and maintenance, Rehabilitation, Reliability, Repairing, Monitoring, Water supply, California, Facilities.
Identifiers: *Preventive maintenance, San Francisco Bay area.

Preventive maintenance is an absolute necessity in all water systems. The preventive maintenance program may be divided into three categories: the local distribution system; the water production system; and the dams in both systems that come under the jurisdiction of the state Department of Water Resources. 'Maintenance' is defined as the upkeep of district facilities with goals of efficient operation, a minimum of breakdowns, good appearance, reasonable costs, extended useful life, and safety. Maintenance can be classified in three categories: routine maintenance, emergency repairs and regular inspections. The East Bay Municipal Utility District of California has three major maintenance programs. The first program is concerned with the dams, seven of which impound surface runoff and 24 which hold treated water. The responsibility for inspection, maintenance and repair of aqueduct transmission facilities is the second program. The third and largest program pertains to the local distribution system. The goal of the district's maintenance, inspection, and surveillance programs is safe, efficient, uninterrupted operation. Preventive maintenance programs on all facilities of storage, transmission, and distribution must be well organized, well equipped and well manned in order to be effective. An overview of the District's inspection and maintenance program is given. (Poertner)
W75-07115

A SMALL SCALE SWIRL CONCENTRATOR FOR STORM FLOW,
Wisconsin Univ., Milwaukee.
For primary bibliographic entry see Field 5D.
W75-07130

REMOVAL OF AIR FROM WATER LINES BY HYDRAULIC MEANS,
MacLaren (James F.) Ltd., Willowdale (Ontario). Hydrologic Sciences Div.
P. E. Wisner, F. N. Mohsen, and N. Kouwen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY2, Proceedings Paper 11142, p 243-257, February 1975. 16 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Air entrainment, Hydraulics, *Dimensional analysis, *Pipe flow, Pipelines, Flow, Hydraulic similitude, Model studies, Velocity, Water, Mechanical equipment, Froude number, Bubbles.
Identifiers: *Air removal, Pipeline summits.

Removal of air from water lines by mechanical devices or by hydraulic action of flowing water was described. Published results on the hydraulic removal of air were discussed. A dimensional analysis was performed for stable air pockets in a pipe. An experimental setup of 10-inch pipe was made to test removal of air pockets from a summit or high point in the pipe line. Test results were presented and compared with previously available data. It was concluded that: (1) no similitude was found for the time of clearance of isolated air pockets in water lines, (2) results of model tests gave conservative estimates for the time of clearance if scaled by the Froude law, and (3) for pipe under 1 ft diameter clearance of air pockets was found to require very high velocities. Mechanical air removal devices were recommended for cases in which hydraulic removal was not possible or was too slow. (Adams-ISWS)
W75-07184

LOW-HEAD AIR-REGULATED SIPHONS,
Tana River Development Authority, Nairobi (Kenya).
C. R. Head.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY3, Proceedings Paper 11155, p 329-345, March 1975. 10 fig, 14 ref, 2 append.

Descriptors: *Siphons, *River regulation, *Flow control, *Spillways, *Water control, Design, Discharge(Water), Weirs, Model studies, Froude number, Hydraulic structures, Hydraulics, Hydraulic similitude, Water levels, Air entrainment, Flood control, Hydraulic models.
Identifiers: Discharge characteristics, Air-regulated siphons.

The development of air-regulated low-head siphons for river control works was discussed. This type of siphon has a very flat stage-discharge curve which has been found desirable. If the structure was designed for the head, an air-regulated siphon would flow full at higher heads. Typical section and design details were shown. The several flow phases were discussed. Combined spillways with siphons and weirs were described and discharge curves were presented for them. A design method was described. The need for Froude law model studies to complete most designs was mentioned. The models were needed because important design details such as the inlet lip, crest, nappe deflector, and outlet lip cannot be determined by analytical means. (Adams-ISWS)
W75-07186

UNIFIED FORMULATION OF WALL TURBULENCE,
Ebasco Services Inc., New York.
For primary bibliographic entry see Field 8B.
W75-07336

8D. Soil Mechanics

EARTH MANUAL, A WATER RESOURCES TECHNICAL PUBLICATION.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Second Edition, 1974. 810 p, 135 fig, 6 tab, append.

Descriptors: *Publications, *Soil mechanics, *Soil physical properties, *Earthworks, *Soil classification, *Soil engineering, *Soil investigations, Documentation, Soil compaction, Construction, Earth dams, Earth materials, Foundations, Soil tests, Testing, Laboratory tests, Sampling, Instrumentation, On-site tests, On-site investigations, Analytical techniques, Exploration, Canals, Pipelines, Soil stabilization, Soil groups, Engineering, Subsurface investigations.

The following subjects were discussed: (1) properties of soils including identification and classification, index properties, and engineering properties; (2) investigations including stages of investigations, principles of investigations, exploratory methods, and recording and reporting of data; and (3) control of earth construction including principles of construction control, earthwork, foundations, rolled earth dams, canals, pipelines, miscellaneous construction features and stabilized soils. An extensive appendix presents procedures for sampling, classification, laboratory and field tests of soils, and instrument installations. Although the Manual is primarily geared to the Reclamation organization, engineers and technicians of other governmental agencies, foreign governments, and private firms can, with modifications, utilize the information as a guide to their individual investigations, control of earth construction, and laboratory testing since emphasis is upon practical applications rather than upon complex theory. Users should recognize that certain recommendations and values are the result of experience and cannot always be mathematically proved. The Manual has been written as a guide and aid for the construction of a safe and stable structure with utmost concern for the safety of lives. (Humphreys-ISWS)
W75-07046

INFLUENCE OF SAMPLE DISTURBANCE AND TEST METHOD ON KEY ENGINEERING PROPERTIES OF MARINE SOILS,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W75-07074

ANALYSIS OF LONGITUDINAL BEHAVIOUR OF BURIED PIPES,
Sydney Univ. (Australia).
H. C. Poulos.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-231 685, $3.75 in paper copy, $2.25 in microfiche. December 1973. 35 p, 17 fig, 23 ref, append.

Descriptors: *Pipelines, *Soil mechanics, *Movement, Pipes, Conduits, Steel pipes, Culverts, Engineering structures, Piping systems(Mechanical), Pipe foundations, Structural analysis, Deflection, Deformation, Structural design, Structural behavior.

The longitudinal behavior of a buried pipeline was analyzed in relation to two cases: (1) a pipeline beneath a loaded area and (2) a pipeline situated in a swelling or shrinking soil. The effects of various factors such as the relative flexibility of the pipe, the depth of embedment, and the magnitude of the soil movement were investigated for each case. The relative flexibility of a pipeline is characterized by a dimensionless factor, K sub R, and it was shown that large moments and end-reactions may be developed in relatively stiff pipelines in which K sub R is greater than or equal to 0.01. A limited number of comparisons between measured and theoretical behavior of pipelines showed that the theory is capable of predicting the order of magnitude of pipeline moments and deflections. (Sims-ISWS)
W75-07166

STABILITY OF STRUCTURES WITH INTERMEDIATE FILTERS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India). Ground Water Div.
For primary bibliographic entry see Field 8A.
W75-07183

EVALUATION OF THE CAUSES OF LEVEE EROSION IN THE SACRAMENTO-SAN JOAQUN DELTA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W75-07210

MASS PHYSICAL PROPERTIES, SLIDING AND ERODIBILITY OF EXPERIMENTALLY DEPOSITED AND DIFFERENTLY CONSOLIDATED CLAYEY MUDS,
Tuebingen Univ. (West Germany). Geologisch-Palaontologisches Institut.
For primary bibliographic entry see Field 2J.
W75-07266

8E. Rock Mechanics and Geology

SOC73, A ONE-DIMENSIONAL WAVE PROPAGATION CODE FOR ROCK MEDIA,
California Univ., Livermore. Lawrence Livermore Lab.
J. F. Schatz.
Report UCRL-51689, November 5, 1974. 35 p, 26 fig, 26 ref. AEC Contract W-7405-Eng-48.

Descriptors: *Mathematical models, *Computer models, *Rock mechanics, Explosives, Rock properties, Excavation, Rock excavation, Rocks, Deformation, Stress, Physical properties, Geology.

SOC73 is a highly modified version of SOC, a computer program that numerically simulates mechanical wave propagation in geologic media. Innovation in SOC73 lies mainly in the constitutive modeling of solid media. New models were introduced in which the pressure-volume behavior and the behavior of brittle, ductile, and tensile failure are more continuous and representative of laboratory and field observations than before. There are also new methods of low-pass compressional filtering and high-pass distorsional filtering that are more physically and numerically satisfying. The concept of failure-associated strain was also introduced. It allows an estimate of the damage caused to the medium by an inelastic stress wave. (Sims-ISWS)
W75-07041

8G. Materials

REPORT ON CONDITION OF CAST IRON PIPE,
Toronto Dept. of Public Works (Ontario).
M. J. Long, M. F. Oster, and F. T. Booth.
(1970) 7 p, 4 fig, 1 tab.

Descriptors: *Maintenance, *Inspection, *Water conveyance, *Pipes, *Water distribution(Applied), *Metal pipes, Distribution systems, Linings, Canada, On-site investigations, Testing, Flow friction, Roughness coefficient, Strength of materials.
Identifiers: Toronto(Ontario-Canada), Water pipe survey, Cast iron pipe.

Because the water distribution system of Toronto, Ontario, Canada was, for the most part, constructed between 1870 and 1942, the Department of Public Works felt the need to evaluate the system. From the information obtained from the two methods of examination, hydraulic tests and the physical tests, it was possible to choose the type of improvement programme best suited to overcome inadequacies, such as reconstruction of existing mains, cleaning and cement mortar lining, or construction of additional mains. The measured 'C-values' (roughness coefficient) indicated that there is a correlation between the age of the main and the coefficient of friction, in that the older the main the lower the value of 'C'. Pictures of the interior of the pipe show that there is no great reduction in cross-sectional area, but the surface of the cast iron is very rough and produces excessive head losses. The ring tests indicated that the strength of a cast iron pipe is not materially affected by age. Where areas of pressure and flow are unsatisfactory under current and expected future rates of flow, a cleaning and cement mortar lining programme will be considered. Future pipe will be installed with a cement lining. (Poertner)
W75-07125

REPORT ON CLEANING AND CEMENT MORTAR LINING OF SMALL DIAMETER WATER-MAINS.
Toronto Dept. of Public Works (Ontario).
(1970) 15 p, 1 tab.

Descriptors: *Water conveyance, *Protective linings, *Cement grouting, *Metal pipes, *Water distribution(Applied), *Cleaning, Descaling, Linings, Canada, Maintenance, Flow friction, Roughness coefficient.
Identifiers: *Cement mortar lining, Water mains, Toronto(Ontario-Canada), Cast iron pipe, Pipeline maintenance.

As a result of a survey of the water distribution system in the City of Toronto, it was found that the capacity of the system was considerably reduced due to tuberculation of the mains which caused low flow coefficients. Consequently, it was decided to embark on a programme of cleaning and cement mortar lining of the mains. Prior to any cleaning and lining being undertaken, temporary by-pass piping was laid on the surface of the street and the water services of any consumer affected were connected to it. Cleaning of the pipe was carried out by either hydraulic or drag cleaning. When the main had been satisfactorily cleaned, a squeegee was dragged through several times to completely de-water the pipe. The lining equipment consisted of a power plant, mixer, mortar pump, hose, lining machine and pulling unit with variable speed drive. After the mortar has set for a minimum of twenty-four hours, the nipples are replaced and the main charged and chlorinated and flushed. The services are returned to normal use, the by-pass removed and the excavation backfilled. It was concluded that an air operated lining machine is more reliable than electric in small diameter pipe. A small diameter main can be cleaned and lined for as little as 1/3 the cost of a new main. Cleaning and cement mortar lining improved existing flow capacity as much as 2 1/2 times for less than half of the cost of a new main. (Poertner)
W75-07126

CAVITATION, A NOVEL DRILLING CONCEPT,
Mobil Research and Development Corp., Dallas, Tex. Field Research Lab.
For primary bibliographic entry see Field 8B.
W75-07337

8H. Rapid Excavation

SOC73, A ONE-DIMENSIONAL WAVE PROPAGATION CODE FOR ROCK MEDIA,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8E.
W75-07041

8I. Fisheries Engineering

ECOLOGICAL CONSEQUENCES OF THE PROPOSED MORAN DAM ON THE FRASER RIVER,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 6G.
W75-07174

LIFE HISTORY, ECOLOGY, AND MANAGEMENT OF THE SMALLMOUTH BUFFALO, ICTIOBUS BUBALUS (RAFINESQUE), WITH REFERENCE TO ELEPHANT BUTTE LAKE,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 6C.
W75-07343

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

BETTER WATER FOR BETTER LIFE.
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 9D.
W75-07147

9D. Grants, Contracts, and Research Act Allotments

BETTER WATER FOR BETTER LIFE.
Michigan State Univ., East Lansing. Inst. of Water Research.
(1974). 40 p, 38 ref. OWRT A-999-MICH(2).

Descriptors: *Water Resources Institute, *Universities, *Facilities, Organizations, Contracts, Grants, Projects, Water Resources Research Act, Water resources, Water resources development, Water quality, Water pollution, Pollutants, Management, Personnel, Planning, Michigan.

The history and activities of the Institute of Water Research (IWR) at Michigan State University were described. The IWR was established in 1961. It is presently supported by the University, industrial grants, private foundations, federal grants and contracts, and funding from the Office of Water Resources Research. Research projects involving lakes and streams, pollution, and management of water quality were briefly reviewed. The teaching and service activities of the IWR were described, and biographical information was provided for the current staff. A list of publications was included. (Sims-ISWS)
W75-07147

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY AND INDEX OF GEOLOGY AND HYDROLOGY, FRONT RANGE URBAN CORRIDOR, COLORADO,
Colorado Univ., Boulder. Dept. of Geological Sciences.
For primary bibliographic entry see Field 3D.
W75-07218

10F. Preparation Of Reviews

CORRESPONDENCE CONFERENCE ON REMOVAL OF NITROGEN FROM MUNICIPAL WASTEWATER,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W75-06984

THE INTERACTION OF VELOCITY DISTRIBUTION AND SUSPENDED LOAD IN TURBULENT STREAMS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 2J.
W75-07039

EXAMINATION OF WATERS: EVALUATION OF METHODS FOR SELECTED CHARACTERISTICS.
Australian Water Resources Council, Canberra (Australia).
For primary bibliographic entry see Field 5A.
W75-07154

FORMALIN AS A THERAPEUTANT IN FISH CULTURE,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 05C.
W75-07342

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Pheasant Feeding Study Using Seeds Treated with Methyl and Phenylmercury,
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W75-06871 5D

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Geophysical Monitoring for Climatic Change, No. 2, Summary Report 1973.
W75-07076 7C

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ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
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Illinois State Water Survey, Hydrology	W75-06998 -- 07021 07023 -- 07052 07054 -- 07065 07067 -- 07068 07146 -- 07152 07154 -- 07192 07194 -- 07199 07244 -- 07261 07264 -- 07270 07334	146
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W75-06861 -- 06895 06931 -- 06933	38
National Water Well Association, Water Well Construction Technology	W75-07335 -- 07337	3
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C. Other		
Army Engineer Waterways Experiment Station	W75-07280 -- 07289	10
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C. Other (Cont'd)		
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National Oceanic and Atmospheric Administration	W75-07069 -- 07082	14
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Vanderbilt University, Metals Pollution	W75-06897 -- 06898 06900 -- 06930	33

PRINTING OFFICE : 1975 O - 210-951 (27)